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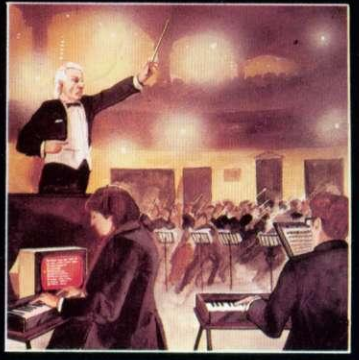
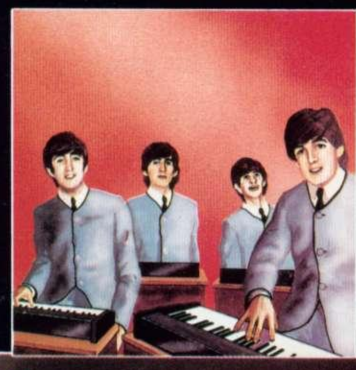
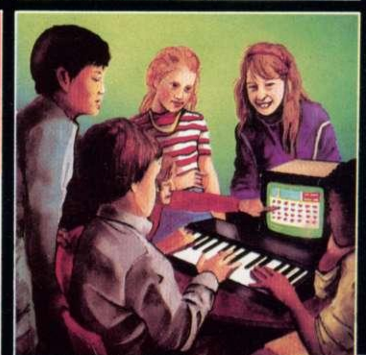
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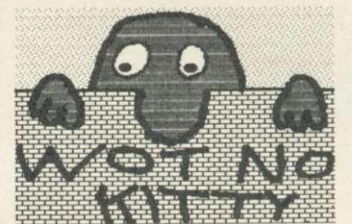
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Editor *Tony Quinn* Technical editor *Bruce Smith* Sub-editor *Julie Carman* Editorial assistant *Kitty Milne* Art editor *Nigel Wingrove* Publishing director *Michael Potter* Editorial director *Christopher Ward* **Editorial** Redwood Publishing Ltd, 68 Long Acre, London WC2E 9JH. Tel: 01-836 2441. **Advertising** Simon Goode, Advertising manager, Computer Marketplace Ltd, 20 Orange St, London WC2H 7ED. Tel: 01-930 1612. **Subscriptions** Kate Evans, Redwood Publishing, 68 Long Acre, London WC2E 9JH. Tel: 01-836 2441. Rates: UK £15; Europe £25; Middle East, Americas, Africa £30; Rest of the world £35 (prices include p&p for 12 issues). Published by Redwood Publishing Ltd, 68 Long Acre, London WC2E 9JH.

Typeset and printed in Great Britain by Watmoughs Ltd, Bradford. Print production by Aquarius Print and Design, London. Distributed to the news trade by Comag, Tavistock Rd, West Drayton, Middlesex UB7 7QE. Tel: (0895) 44405.

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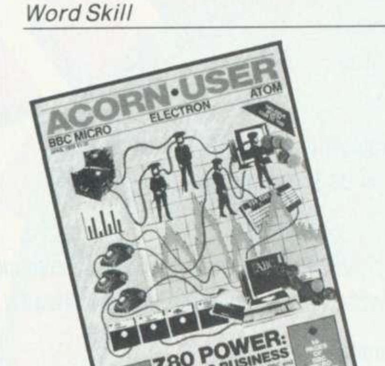
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Cover illustration by Carol Moss

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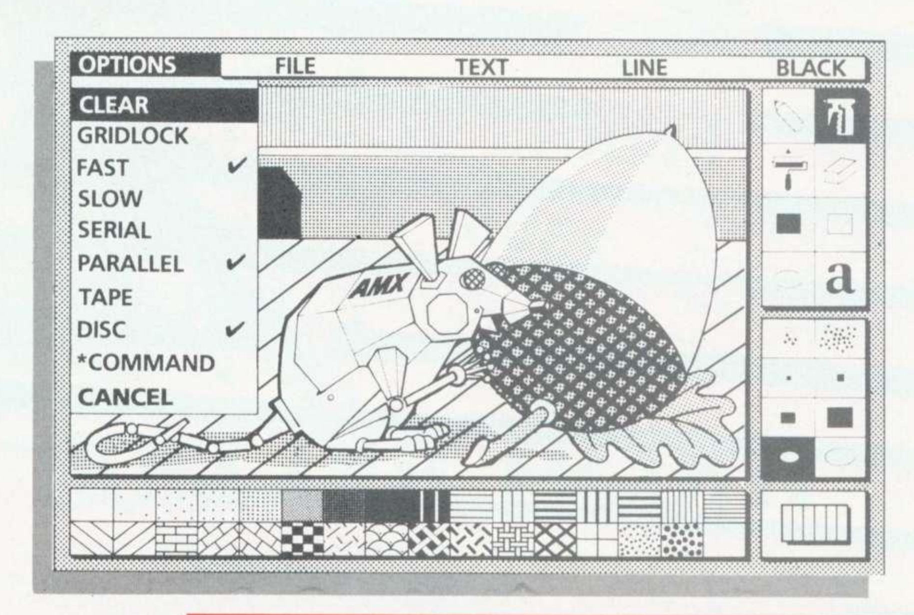
Acorn User welcomes submissions from readers. Articles should be typed, double-spaced text with diagrams and screen dumps on separate sheets, or on disc in *Wordwise* (saved as a *SPOOL file using option 8) or *View* format. Leave large margins to allow space for editing. Please enclose all programs on disc or cassette, with listings if possible. Also follow the style used in presenting listings in the yellow pages section. Photos should be 35mm, or larger, transparencies, or 5in by 7in black and white prints. Ensure your name is on everything, and keep a copy. Enclose a suitable stamped, addressed envelope if the submission is to be returned. Attach a short letter with the article giving its title with a day time phone number if possible. Address your article to the Technical editor. Articles are acknowledged on receipt, but not submissions for the regular columns, letters pages and competitions. Please limit telephone enquiries to the Technical editor to Wednesday and Thursday afternoons.



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SUNDAY 10 FEBRUARY 1985

From little Acorn—a crisis grows

Acorn replaces financial advisers

BY JASON CRISP



Olivetti sort out Acorn

AT 2.30 in the morning of February 20, Hermann Hauser and Chris Curry, the two founders of Acorn, signed away their controlling interest to the Italian company Olivetti.

This combination – Acorn's strength in research and education with Olivetti's business and international markets – is seen as a potent combination.

Now the industry will look to Sinclair, which is not without problems, and Amstrad, as the two other large producers of micros in the UK for an indication of the state of the market.

Olivetti's stake will cost about £12 million, three-quarters of which will be used to allow for the reduction of value in stock caused by price-cutting, and losses in the USA and Germany. Acorn has announced that its total losses for the six months to January will be £11m.

This agreement will be put to Acorn shareholders at an extraordinary general meeting in the next month.

Olivetti, which is showing a series of TV adverts based on the Mr Men characters, will have a 49.3 per cent share in Acorn with the right to increase this to 50.1 per cent. Hauser and Curry's share will be cut from 87 to 36 per cent.

The whole structure of the company is being revised, and a new board appointed. A total of 120 people will be made redundant.

It appears Olivetti will support Acorn in going for education contracts in Europe, but – contrary to some reports – Acorn is not pulling out of home computers. Development plans for the BBC system look safe and Electron production is continuing.

Elserino Piol of Olivetti stressed Acorn's 'outstanding technical expertise' and 'well established position' in the educational market. A joint statement by the companies added that Acorn will have access to Olivetti's international marketing to create 'a major drive in the world's education markets'.

There will be four new divisions within Acorn: education and training, scientific and industrial, business, and consumer. However, the emphasis will be on the former to reduce Acorn's dependence on the 'volatile home computer market'.

Four present managers have been appointed heads of these sections. Hauser and Curry will become deputy chairmen and the present acting chief executive Alex Reid will become chairman. Two other directors will be placed by Olivetti, and a managing director brought in.

Beeb safe, but ABCs under review

THE BBC has said it is 'extremely satisfied' with the Olivetti deal and expects no change in the contract with Acorn.

But speculation continues over the future of the Electron and ABC business micros.

With 100,000 Electrons unsold, and the amount of components in stock, Acorn will undoubtedly have to pull out all the marketing stops available. The fear is that by next Christmas the Electron will be outdated and too expensive.

Production of the ABCs is reported to have stopped and Olivetti will no doubt hold back release of the range until a strategy of dovetailing it into its own products is established.

However, the Communicator looks safe. Its accent on communications with built-in software and small size for under £1000 has already been established with the OPD from ICL.

As a 'cheap version' of the BBC micro, the Electron has had an unhappy history. Although well received in 1983, it missed the Christmas rush and Acorn's decision to keep the price at £200 against opposition like the Amstrad and Spectrum in the Autumn of 84 must be seen as a mistake in retrospect.

AB Electronics is still building Electrons. Chairman Henry Kroch explained production was at a 'very low rate', mainly because of the stocks.

What caused the big crash?

BEHIND all the figures lies the fact that Acorn simply ran out of money. The company spent £4m on advertising to sell 300,000 computers over Christmas and only sold two-thirds of that figure. And that's a lot of computers not to sell – hence the £70 reduction in price on the Electron.

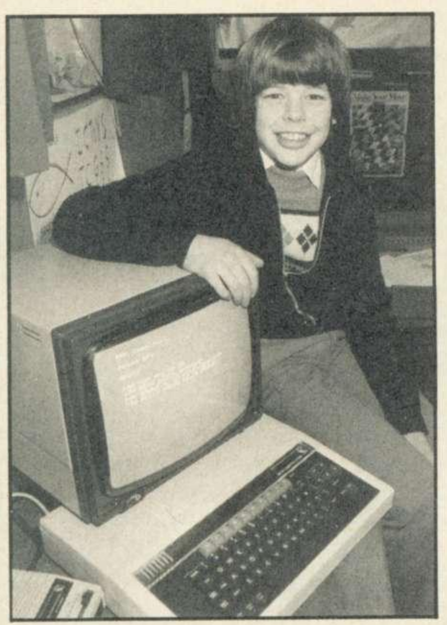
The company might have ridden out the storm but for losses in the US and unfavourable Press and market reports which undermined its credibility. Creditors got itchy, and all it took was for a few to ask for the money owed them and the bubble had burst.

One of the companies starting ABC assembly pulled out, as did another on the BBC side. However, Acorn has had close co-operation from its biggest manufacturer, AB Electronics, which assembles BBC micros and Electrons in Wales.

This company's shares were riding high through the troubles, despite Acorn accounting for a large part of their business.

Details of Acorn's restructuring have yet to be announced, but 120 staff are to go – a quarter of the total workforce.




David won BBC system

David Essex in the limelight after victory in chess contest

More than 6000 primary schools entered Britain's first chess championship on computer played through the BBC's Ceefax system using Acorn's Teletext adapter.

The winner was David Essex from Scamblesby School in Lincolnshire, who beat Cathy Haslinger from Hayes Park School in Middlesex. David was the British under-nine champion (he's now ten), and number one seed for the competition.

Both finalists win Acorn equipment. Cathy gets a BBC micro for her school, and David a BBC plus peripherals.

More recently, Monster Y, a chess computer, was defeated in the Commonwealth Championship in London. It got through the first round, but was beaten in its second match by international master Daniel King after a five-hour battle.

At least these contests didn't have the problems of recent world matches between the Russians where the contestants were hiring 'parapsychologists' to stare each other out, and pulling each other's chairs apart in the search for illegal equipment!

Torch in Belgrano feud

Micros seem to be getting in on the act everywhere. Latest front page story with a micro angle was the bitter exchanges between Prime Minister Margaret Thatcher and Labour leader Neil Kinnock over the trial of civil servant Clive Ponting who leaked information on the sinking of the Argentinian warship General Belgrano.

'The letters were probably written on Torches,' said a Torch spokesman.

Neil Kinnock has a C series Torch with hard disc in his House of Commons office. Mrs Thatcher has gone one better. She has a network of C series Torches up and running in the Cabinet Office at Number 10.

(Readers may remember our Diary piece about Neil Kinnock's system in last July's issue, where a word-processed Press release went out with the last paragraph missing!)

'It is probably the only thing they have in common,' said the Torch man.

The battling politicos could have made their exchanges of letters even more rapid were they to use Torch's MailPlus electronic mail software. The only problem is, what would the papers and TV have used in place of the photos of the 'Dear Mr Kinnock' and 'Dear Prime Minister'?



Kinnock and Thatcher: to war with a Torch

Battle against piracy

FAST, the Federation Against Software Theft, is to increase its fight against program piracy by a publicity campaign with posters and badges distributed through the group's members.

The Federation represents the interests of the software companies in trying to stamp out piracy, particularly of games. The group is sponsoring the Copyright (Computer Software) Amendment Bill at present going through Parliament.

This Bill is being backed by Conservative MP William Powell, and seeks to outlaw illegal copying of programs with heavy penalties for offences – unlimited fines and up to two years in prison.

It follows similar action taken in 1982 to amend the 1956 Copyright Act to take into account video tapes. This was pushed through very quickly and virtually stopped the film pirates overnight.

For more information contact FAST at Chancery House, Chancery Lane, London WC2A 1QU.

Our new columnist takes a sideways look at the news...

Uncle Clive certainly put the cat among the pigeons when he slashed the price of the Spectrum+ (you'll be glad to know the keys don't fall off now, thanks to a new adhesive distilled from the hooves of only the finest horses. Hi-tech really pays off.)

The new price-cutting is like the outbreak of World War 3. One practice missile rashly fired and suddenly we're all in the bunkers blaming each other.

Electron price down to £129 (95p cheaper than the Spectrum!). Commodore Plus 4 halved to £149. Apple attacks the education market, offering a 50 per cent discount to schools. It's possible even the Macintosh may come within the scope of the scheme. Where will it all end?

You never know, Acorn might even reduce the price of their chip-in-a-box, the 6502 second processor. After all, it's got an even worse keyboard than the Spectrum and I can't find any socket to plug my cassette deck or anything else into.

Anyway, to happier things. Have you seen any of the extremely cheap Firebird games from BT? I've got two – *Hacker*, a sort of *Felix in the Factory*, and *Duck* all about shooting poor little ducks. The games themselves are pretty good, but what I really like is the music that plays as they load.

Hacker has 'Blaze Away' and *Duck* has 'La Belle Hellene'. I know it should be the other way round, but there you are. Melvyn Wright who wrote *Duck*, did the music for both of them, so you'd think they would have given him first choice. Maybe they did.

If you have musical ambitions for the Beeb, listen to them and find out how it should be done.

I've put the musical bits onto disc to play them when I want. Since they're interrupt-driven I can listen to them while I'm pounding my finger on the keyboard doing something else. I hope that's not illegal.

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DIY viewdata from Communitel

COMMUNITEL claims its viewdata and electronic publishing system is cheaper than the alternatives offered by Prestel and the Times Network.

Communitel enables users to set up a Prestel-like database on BBC micros for in-house use or as an information service for others to dial in to. Unlike the others, it relies on the users to provide information and organise it. However, it does give access to these services.

For £45, the company offers viewdata software, which can be upgraded to run the full communications set-up. For £325, Communitel offers viewdata software and auto-answer modem.

Contact Communitel at 189 Freston Rd, London W10 6TH.

Career facts

STUDENTS about to leave school and embark on a career can get facts from a series of discs on areas such as teaching, finance, broking and insurance.

In all there are eight titles, with another five planned. Each disc costs £11.44 (40 or 80 track), with cassettes at £10.29 each.

The publisher, Careerdata, is at Yeoman House, 76 St James Lane, London N10 3RD.

Micro winner

THE winner of the BBC micro on offer at the High Technology and Computers in Education Exhibition at the Barbican in January was M Smith of Norwich.

Inform register

USERS of Inform, the £15 database from Nottingham Computer Education Centre, are being asked to provide information of their data to help set up a central register.

Contact the centre at Eaton Hall, Retford, Notts DN22 0PR.



British Thornton's CAD system at the recent Design and Technology exhibition in London's Wembley Centre

BBC system for CAD users

SCHOOLS, architects and small businesses can give their Beeb designer power with a CAD system from British Thornton, called Compass. The package contains a 2D shape generator which allows 3D viewing and modification. Designs may be viewed in any one of seven projections.

Package prices for digitiser, plotter and software start at £3,664 + VAT. Contact British Thornton on 061-998 1311.

ROM books for the Beeb

THE flow of books continues unabated. Among the latest releases is something for everyone.

One book not to be without is the *BBC Micro ROM Book* by *Acorn User*'s own Bruce Smith. It tells you everything you ever wanted to know about sideways ROMs and RAMs including how to write your own sideways firmware. Published by Collins, it costs £9.95.

Also on the ROM front is the *Wordwise Applications Guide* from T Roberts, Lamora, The Street, Bunwell, Norfolk, price £7 including postage. Written by Paul Beverley, another *AU* writer, it is the accumulated wisdom of a dedicated *Wordwise* user.

Other utilities books include two new titles from Century. *Epson Printer User's Handbook* is self explanatory. Written by Weber Systems it costs £9.95. *Maths Tutor* for the BBC/Electron by Robert Carter costs £7.95 and is a comprehensive treatment of the subject including differentiation and integration.

For puzzlers and mystery addicts there is *Micro-computer Puzzles* (Collins, £6.95) by Garry Marshall. It is a collection of brainteasers which first appeared in the *Observer* magazine. Background information and various techniques are set out to help you solve the puzzles.

Alternatively, two new solve-it-yourself computer mysteries have been published by Armada at £1.25 each. Entitled *The Bytes Brothers Record a Robbery* and *The Bytes Brothers Go to a Getaway*, they are the usual formula of five short stories containing within the text short computer programs that will help you to solve the mysteries.

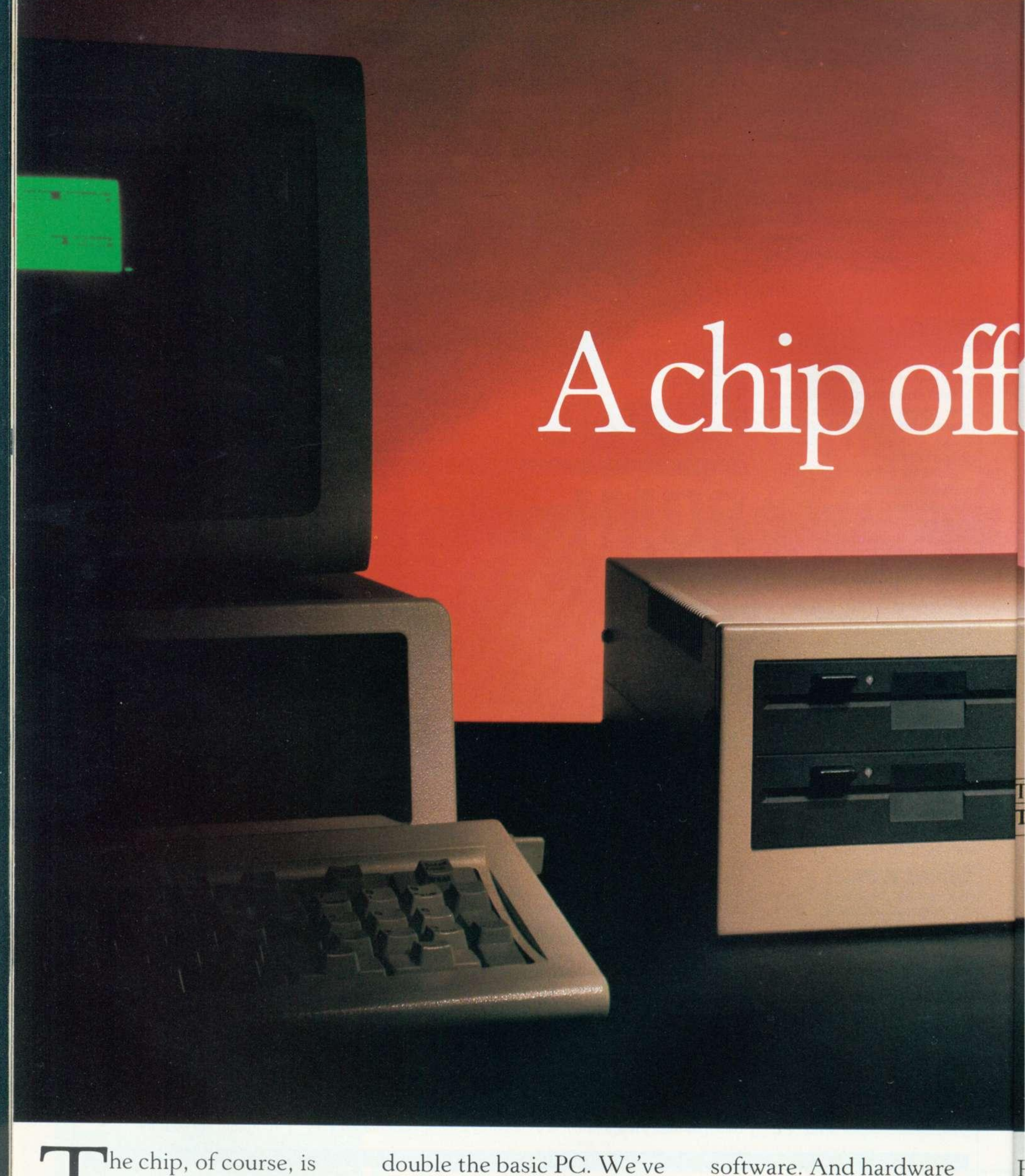
The *Secret of Arendarvon Castle* (Addison-Wesley, £5.95) will involve considerably more typing. The book contains the listing for a lengthy adventure. The rest of the book includes maps, diagrams, illustrations and a wealth of information that will help you survive the ordeal.

If writing adventures is more to your taste, take a look at A Bradbury's *Adventure Games for the BBC Micro* (Collins, price £6.95). And for the wargamer there is *BBC Micro Wargaming* by Owen and Audrey Bishop (Collins, £8.95).

BRUCE SMITH
THE BBC MICRO ROM BOOK
SIDEWAYS ROMs AND RAMs

Electron owners wanting to sharpen up their programming skills should take a look at *Programming the Electron* (Newnes) and *Getting the Most From Your Acorn Electron* (Penguin, price £6.95).

Telecommunications in Practice (British Telecom at £5) is aimed at educationalists. The full ins-and-outs of British Telecom and telecommunications are covered in what the BT chairman describes as the 'standard work of reference in science classrooms throughout the country'.

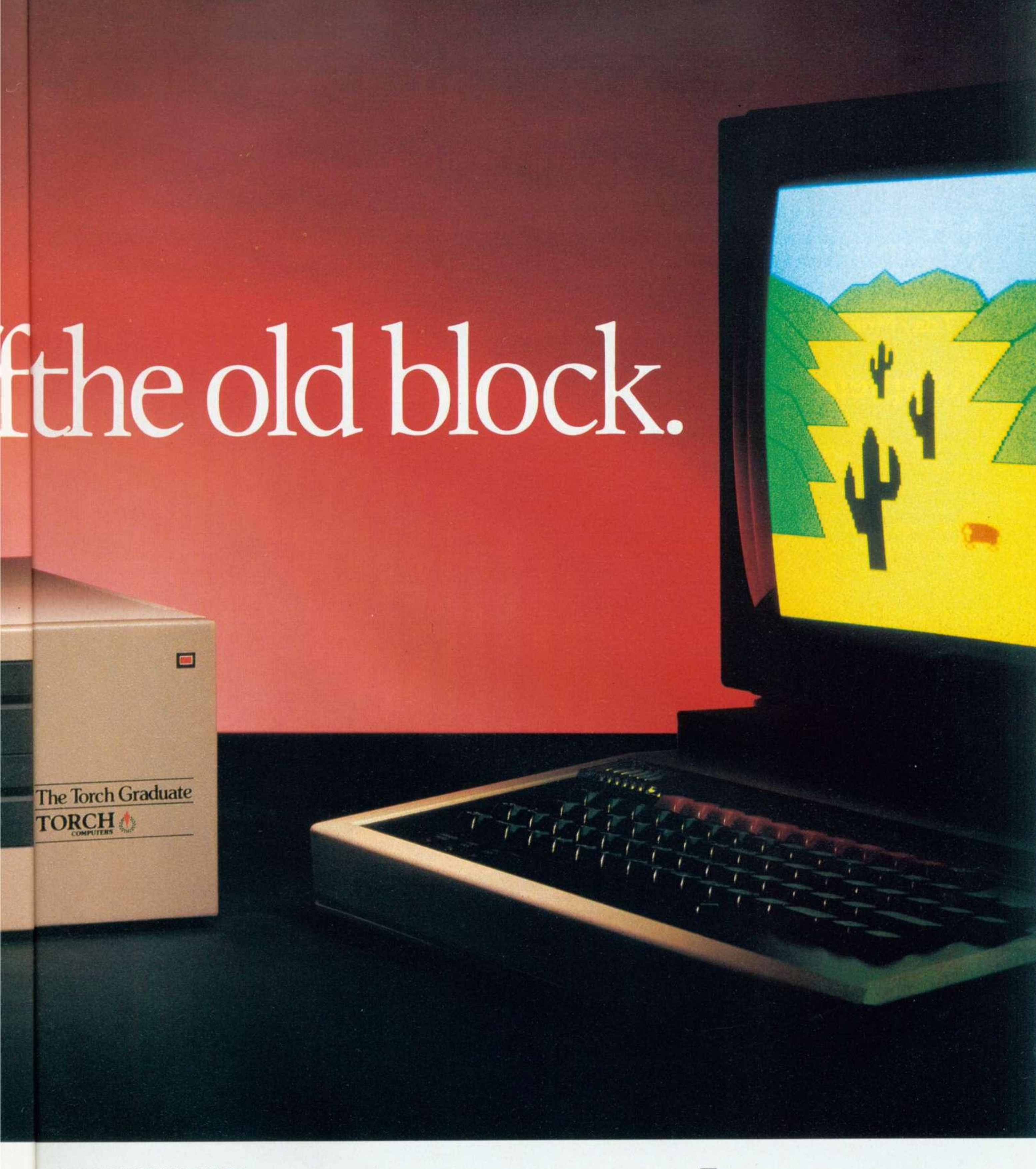


The chip, of course, is the 8088 as used in the IBM® PC. The operating system is customised to MS™-DOS compatibility. The user memory is 256K RAM, that's four times as much as big brother. The floppy disc storage is 720 Kbytes, that's more than double the basic PC. We've only got two expansion slots, but there again we use them for expansion and don't need to tie them up with basics such as colour graphics or printer ports.

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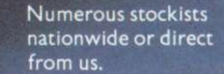
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Lords warning to schools

Acorn's Chris Curry and other experts on micros and education last year gave their views on Britain's progress in teaching about, and with, computers to a House of Lords committee. We summarised Curry's opinions last September where he expressed concern about teacher training. Here, Bill Penfold outlines the results of their Lordship's inquiry.

BRITAIN appears to be doing pretty well with its classroom computer programme . . . lots of micros, mainly Beebs, have certainly flooded into almost every school. Millions of youngsters are turning hands-on experience into high flying expertise, making the mysterious micro a familiar friend.

Unquestionably, the one-time wonder has become the most popular plaything of our times. If today's school kids are not tapping in programs they're zapping the software.

It looks impressive. But is it really going to make it easier for Britain to face up to the challenge of computers? Or are we missing the real chances of facing the industrial future . . . and winning?

According to at least one influential source, despite all these micros there are still some basic attitudes which need changing if we are to measure up to future needs and competition from the USA, Japan and the rest of Europe.

The warning has come from the Lords Select Committee on Science and Technology which has been looking at education and training for new technologies.

Its conclusions – technological progress is being held back by a national failure to educate and train people of the right quality and in the right quantities. And the problems start in primary school.

The peers came up with some tough criticisms of Britain's track record, and even more worrying, the prospects for the future.

But what about that warm glow we've managed to kindle over the success in putting classroom computers into almost every school in the country, the vast majority of them Beebs?

Like many other school reports, the Select Committee, headed by Lord Gregson, concluded: 'Has made progress . . . but could do better.'

The kind of progress they want to see are new schemes developing the use of computers across the school curriculum. In particular, the committee felt a need to put more attention on the retraining of teachers, and that increasingly vexed subject of educational software.

The headache that software houses face when producing educational programs was graphically spelt out to the committee during its investigations by Acorn boss Chris Curry. You may recall his comment to their Lordships that schools were a den of thieves (*AU*, September 1984).

Whatever the problems though, the committee suggested that the departments of education in England, Scotland, Northern Ireland and Wales should get a grip on ensuring more suitable software is available.

What also worried the peers was – what happens next? The Micros in Schools scheme was generally reckoned to be a success, as was the Microelectronics in Education Programme. But both are due to end by 1986.

As their Lordships point out: 'The physical installation of the equipment is only half, or less, of the battle.' The real issue is that once installed the computers should be properly and fully exploited – right across the curriculum.

This is where the need for more software is abundantly clear . . . and the need for more teachers to be trained to use computers in their teaching.

The dangers of staffing schools with teachers who feel 'uneasy' with the new technology is one of the points brought out by the new report: 'Primary school teachers who feel insecure in science pass on their insecurity.'

There was a lot of criticism in the report too about the short-sighted attitude to funding. The trouble, say the Lords, is that education and training budgets remain the most likely to be cut when money is tight.

On top of that, the peers once again spotlight the difficulties faced by girls in general compared to boys when it comes to computer education.

So the education departments have been told in straightforward terms that they should be doing more to help local education authorities to get their acts together.

Design your own arcade game

MAGIC Mushrooms is the latest title from Acornsoft. It's a platform game like *Killer Gorilla*, but the difference is that you can create, save and play your own screens.

This is done by taking the various elements – ladders, slides, ice, trampolines, etc, and putting together a screen where the aim is to get from start to finish, collecting the magic mushrooms on the way, without getting killed in the process.

So players can make up screens to pass around and test their friends.

The game comes with nine sample screens, most written by Acornsoft staff.

Five were created by Neil Raine, author of *Planetoid* and *Meteors*. Others are by Tim Dobson, author of *Maze*, Alan Bellingham and David Johnson-Davies, boss of the company. The starter screen was written by the author of *Magic Mushrooms*, Richard Clay.

There is only one way to solve some of the problems, as in some screens there are traps which you just can't get out of.

Release date was set for March 1, and the game costs £12.95.

Tuesday 9. Official opening and Personal robotics, Covent Garden.
Wednesday 10. Community computing, Covent Garden.
Thursday 11. ITEC exhibition, Covent Garden.
Friday 12. NetReach and communications exhibition, Covent Garden.
Friday 12. Opening of Islington ITEC by Clive Jenkins.
Friday 12 & Saturday 13. Choosing Computers, GLC County Hall.
Friday 12, Saturday 13. Logo Spectacular, London Docklands and LNTN, Camden Town (Richard Olney 01-267 0642).
Monday 15 to Saturday 20. Disability Work Experience, residential pilot camp, Tara Hotel, Kensington.
Tuesday 16. London Decision Makers Conference, Euston Road.
Thursday 18. Competition & Computers on the Stock Exchange, 6pm, Charing Cross Hotel.
Thursday 18 to Saturday 20. London Computer Fair, Central Hall, Westminster.

BBC pictures on video

INTERACTIVE video systems can be built up using an interface board that enables computer-generated text and graphics to be laid over standard TV pictures produced by a video disc player.

Abbey Audio, its makers, says the board sits between the disc player and RGB output of the BBC micro. To work, the BBC must be adapted to display TV pictures by using a 'genlock' system, which Abbey also makes.

The video board fits inside the BBC, and measures 4in by 3in. For details contact Abbey Audio, PO Box 2, Staines, Middlesex.

Timetable for computer festival

THE London Festival of Computing kicks off on April 9 with a four-day extravaganza of competitions, games and exhibitions at Covent Garden.

Robots will be put through their paces and InterAction will be running fun things for kids among other things. See timetable above.

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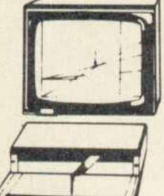
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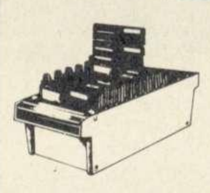
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Disk storage box (50)		£29.95	
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Complete product brochure		FREE	
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Please debit my Access/Barclaycard No. ....

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Philips & Philips Co. Ltd., Scriptomatic House, Torrington Park, Finchley, London N12 9QU. Tel. 01 446 5648

Ambidextrous fire buttons

VULCAN Electronics' new Harrier joystick offers a unique configuration of fire buttons that make it acceptable to both left and right-handed players. And it has suction pads to prevent the whole assembly wandering.

Vulcan also offers a BBC or Electron interface that plugs directly into the analogue port to allow Vulcan or any Atari-style joysticks to be used. The package also includes software that enables joysticks to take over normal keyboard gaming control.

The joystick costs £10.95, and the BBC and Electron interfaces £12.95 and £19.95 respectively.

Contact Tigress Marketing on 01-871 1136 for details.

Hi-tech week

A ONE-WEEK course designed to introduce managers and workers in small firms to information technology is to be run at the Microcomputer Advisory Centre, at London's South Bank Polytechnic.

Forty per cent of the time will be spent working at micros on business applications.

The 'Newtech' course starts on April 29 and costs £100, although MSC training grants can reduce the cost to almost nothing.

Contact Jack Flateau on 01-928 8989, extension 2410.

Pascal talks

THE Department of Computer Science, Queen Mary College, London, is holding an afternoon seminar on 'The Future of Pascal'. Current developments in Pascal standards and the use of improved Pascal in teaching programming will be discussed. The speakers are John Souter, Convener of the BSI Pascal Working Group, and Richard Bornat from the Department of Computer Science, Queen Mary College.

The seminar will take place on April 3, 1985 from 2-5.30pm. Details from Sue White, Department of Computer Science, Queen Mary College, Mile End Road, London E1 4NS, tel: 01-980 4811, extension 3917.

Acorn agent breaks into Russian micro network

ACORN may be having a few domestic problems but overseas things are on the up and up.

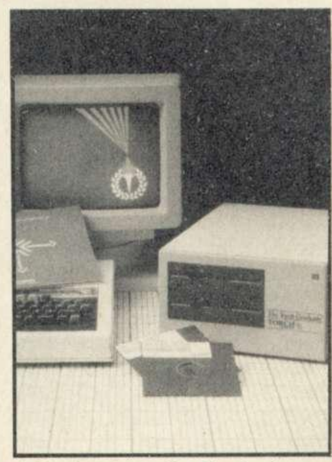
Acorn distributor 3SL Overseas has made its first sales in Russia, and plans are well advanced for a Mexican company to manufacture the BBC under licence (see below).

Breakthrough in Russia follows a year of careful planning by 3SL and should lead to further sales to educational institutions.

The machines sold by 3SL are a Russian version of the Beeb that can display the Cyrillic as well as the Roman alphabet. It was developed jointly by 3SL and Acorn.

Initial deals involve 30 BBC micros and three Econet networks. The Econets will be installed in the state university in Latvia, the ministry of secondary education in Moscow and the ministry of professional and crafts training.





Thirty Beebs are Russia-bound, and Mexico tests the Graduate

The other destinations are the maths department at Moscow University and the Kiev Institute of Welding.

Said 3SL director David Springle: 'Russia is a potentially enormous market. There are 79,000 schools in the country and they have been instructed by the Politburo to improve the level of computer teaching facilities.' But Springle is under no illusions about the difficulties of selling to Russia. 'At the moment they are buying evaluation systems. How many more they buy depends on how much money they have allocated in their budgets,' he said.

'We thought it would take longer to make the first sales. So we are very pleased with our first year's work and expect to see a steady growth in sales in the future,' he added.

The equipment will be shipped out shortly when 3SL has got the necessary export licences. Under the regulations covering the sale of high-technology equipment to Eastern Europe, a special licence is required for the Econet systems and this will take about two months. Stand-alone eight-bit micros such as the Beeb don't require such a licence.

Negotiating sales to Russia is notoriously difficult so 3SL's success is something of a coup. An important factor in that success is that Springle worked for five years in Russia as the representative for ICL, and another 3SL director speaks fluent Russian.

The company will be sending staff to Russia to install the systems and provide training and after-sales support. Eventually, it hopes to establish its own office in the USSR.

Mexico deal gives Beeb south-of-border base

MEXICO is being tipped as the next major market for the BBC micro. Acorn has signed a deal with a 100 per cent Mexican-owned company called Datum to manufacture the machine for Mexico and South American markets.

The licensing deal follows a British Overseas Trade Board mission to Mexico last spring. As a result of the mission the Mexican ministry of education ordered a 48-station Econet network for evaluation.

Acorn's distributing company in Mexico, Harry Mazal, reports a strong interest in the Beeb and says that at a recent show its stand was virtually mobbed.

Datum hopes to be manufacturing 2000 Beebs a month by May. Initially, most of the manufacture will be done in the UK by Acorn with Datum doing the final assembly, but progressively more of the work will be done in Mexico. The aim is for 60 per cent of manufacture to be done locally by the end of June and 85 per cent by the end of the year. Only the ULAs will continue to be manufactured in the UK.

Datum will be selling the Beebs with two Spanish computer languages on ROM.

Acorn sees the Mexican deal as a way of getting into the US market by the back door. Several of the south-western states of the US contain large Spanish-speaking populations.

Torch is also jumping onto the Mexico bandwagon. It has shipped three Graduates to Harry Mazal and these were at a recent show.

This is Acorn's second foreign licensing deal. As a result of the first one several thousand Beebs a month are now rolling off the production line in India.

On television

The current series of BBC TV's *Micro Live* has now ended. But the good news is that when it comes back on October 4 it will become a weekly programme and will probably go out at the more convenient time of 7pm.

There are just two programmes left in the *4 Computer Buffs* series which goes out on Mondays on Channel 4 at 5.30pm. The edition on March 18 will carry a feature on Pascal, a possible interview with Sir Clive Sinclair and the modem corner will look at Knowledge Index, the large American dial-up database.

Communications will also feature heavily in the March 25 edition with a look at the success (or failure ?) of the show's own bulletin board and a round-up of comms. Both shows will, of course carry the usual micro news, software transmissions and infamous flashing blob in the corner of the screen. Meanwhile, we're trying to find out if Channel 4 is paying *PCW*, or vice-versa.

Thames' *Database* programme is set to return to the TV screens in June.

On show

□April 16-18, Northern Computer Show '85, Belle Vue, Manchester. Contact: Mike Birch/Chrissy Cottle, 01-643 8040.

To contact

□Acorn Customer Services (0223) 210111

□Radio 4 *Chip Shop*'s Chipline:
London 01-790 3400
Liverpool 051-236 8474
Birmingham 021-355 6144
Bristol (0272) 279494

□BBC TV's *Micro Live* bulletin board is on 01-579 2288 (type INFO BBC on Telecom Gold electronic mail system).

□BBC Computer Literacy Project, Broadcasting Support Services, PO Box 7, London W3 6XJ. Please send stamped-addressed envelope.

□MEP (Microelectronics Education Programme), Cheviot House, Coach Lane Campus, Newcastle-upon-Tyne, NE7 7XA. Hardware and software support for schools. Please send sae.

□MAPE (Micros and Primary Education), c/o Barry Holmes, St Helen's Primary School, Bluntisham, Cambs. User group for primary teachers. Please send sae.

□MUSE (Micro Users in Schools and Education), PO Box 43, Hull HU1 2HD. User group for teachers and parents. Please send sae.

□National Extension College, 18 Brooklands Ave, Cambridge CB2 2HN. Educational and training courses on the BBC micro. Please send sae.

□CET (Council for Education Technology), 3 Devonshire Street, London W1N 2BA. Government body which oversees MEP. Please send sae.

□Software Limited configure CP/M programs for the BBC micro. Write for a catalogue to No 2 Alice Owen Technology Centre, 251 Goswell Rd, London EC1N 7JQ. Tel: 01-833 1173.

For help

□To contact *Acorn User* authors, write c/o the editorial address given on page 2.

□Seikosha AP/GP100 printer help sheets are available from *Acorn User* for 50p, plus sae. These consist of three programs, including a screen dump, and three pages of notes on using these printers with the BBC micro.

□Monitor choice: Photocopies of the review of four monitors, plus a set of nine test programs from the June issue cost 72p (inc post).

□Bulletin boards: Information on 26 free-access boards was given in the October issue. 54p for photocopy (see page 93).

□For *Acorn User* cassettes, discs, back issues, binders, contact PHS Mailings on (02934) 72208 (see page 96).

On Prestel

TUBELINK is a database for users of second processors on Viewfax, which is part of Prestel Microcomputing.

Pages start at ★258216# and are aimed at programmers with 6502 and Z80 add-ons (Torch and Acorn).

For disc

□Tape to disc transfer utility: June 84, p55.

□40/80 dual format discs: produce discs readable on both types of drives, Feb 84, p69.

Blunderbox

□HEINEMANN, the publishers of the *Dudley Programs* (reviewed December 84), tell us that disc versions are now available. Theme Packs cost £36 + VAT and the Complete Suite, £195 + VAT. They are obtainable from Heinemann Education Books, The Windmill Press, Kingswood, Tadworth, Surrey KT20 6TG.

□LOCO Systems' (Modem review, February issue) phone number should have read 04862 4480.

□THE Fischertechnik Robot Kit is available from Artur Fischer UK, Fischer House, 25 Newtown Road, Marlow, Bucks. Tel: Marlow 72882/6.

□AN error appeared in the Quadline (January issue) disc notes. On page 67, the top of column three should read: "... and enter the following lines from listing 1: 10 to 200 inclusive, 250 to 360 inclusive ...". Also, line 6 of the listing in that column should read:

```
6 FOR L%=0 TO &1000
  STEP 4
```

January's cassette contained the correct listings for Quadline. However they are saved under the author's name as ACTON1 and ACTON2. The former chains the latter in as Q2, which is never found. To use the programs correctly save them to disc or tape using the instructions provided in the article.

□JOE Telford's Ed-fax listing (January issue) contained an error in that the two semicolons in line 900 look like colons. Line 900 should therefore read:

```
900 PRINTTAB(0,24);
  STRINGS$(39," ");
```

Several of you were confused by the pixel editor. Before selecting the graphics mode, and while in alphabetic mode, select the desired colour of the graphics – ie CTRL-f7 for white, then press the Return key to move into the graphics mode. The QWASZX keys can then be used to generate, set and clear teletext pixels.

□ALSO in January, a minor error crept into Peter Sandford's colour fill routine (listing 4, page 117). In certain circumstances, this will cause the routine to leave a single pixel uncoloured when filling into an acute angle. This can easily be overcome by amending the following three lines:

```
4300 CMP &74:BNE
  notequal:CLC
4310 .notequal
4320 LDA xhi:SBC &75
```

These lines should be changed *after* the original listing has been entered and debugged, as they will invalidate the checksum test at line 90. This line should therefore be deleted before assembling the amended code.

□MALCOLM Banthorpe's Turtle program (February issue) contained a slight error. In line 470 the + sign should in fact be a − sign. This now means that you turn left when LEFT is entered rather than turning right in response to LEFT!

How to present programs and articles

FIRST read the 'Notes for Authors' on the contents page.

Your submission should be original and have a practical use. We receive many articles on subjects we have already covered – often quite recently.

A neat and clear presentation is very important. A few hours' thought about how your article looks, diagrams, applications and documentation will ensure that it is evaluated quickly and efficiently, and is more likely to be accepted.

Program presentation is also important. Follow the 'standard' we've adopted in the yellow pages. Most importantly, your program must run on Basic 1. The only exception is if the program is of a Basic 2 tutorial nature. Basic and illegal calls to routines in the MOS should not be used. Program lines should increment in steps of 10, with the first four being REMed as per the format in the yellow pages.

Program listings should not be indented, and avoid multi-statement lines.

Use the standard assembler presentation, one mnemonic per line, upper case mnemonics with lower case labels. If the assembler is long include a checksum.

Provide a list of PROCs, FN's and variables detailing the operation of each on a separate sheet of paper, along with any hints or tips regarding entering the program.

If you're into program writing...

Get this into an envelope

If the programs you are writing involve sophisticated graphics, you have two choices, a severe headache or Touchmaster.

Obviously you'll want to consider the matter, so in the mean time send away for your free Touchmaster literature and find out more about the best value/performance graphics tablet available... or take two pain killers!

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Because it compiles into P-code, Oxford Pascal reduces programs into the most compact form possible. In fact it allows you to pack more code into your BEEB than any other language, and should your programs become too large, you can still use the CHAIN command to overlay limitless additional programs without losing data.

Graphics & Sound Extensions
In addition to the entire Pascal language, Oxford Pascal features a whole range of Graphics (all modes) and sound extensions designed to make maximum use of the BBC computer. Oxford Pascal also provides numerous extensions such as hexadecimal arithmetic and bit manipulation instructions.

Oxford Pascal in Education
In Education, Oxford Pascal is fast becoming a *de facto* standard. It is already the most popular Pascal on the Commodore 64, and will soon be released for the Spectrum and the Amstrad. In fact, Oxford Pascal will soon be available for 90% of the computers installed in the U.K., and is already available in German, French, Swedish, and American versions. **Students and teachers alike find that it makes sense to use a standard implementation of Pascal across the whole range of educational micros.** Call us for details of our generous educational discounts.

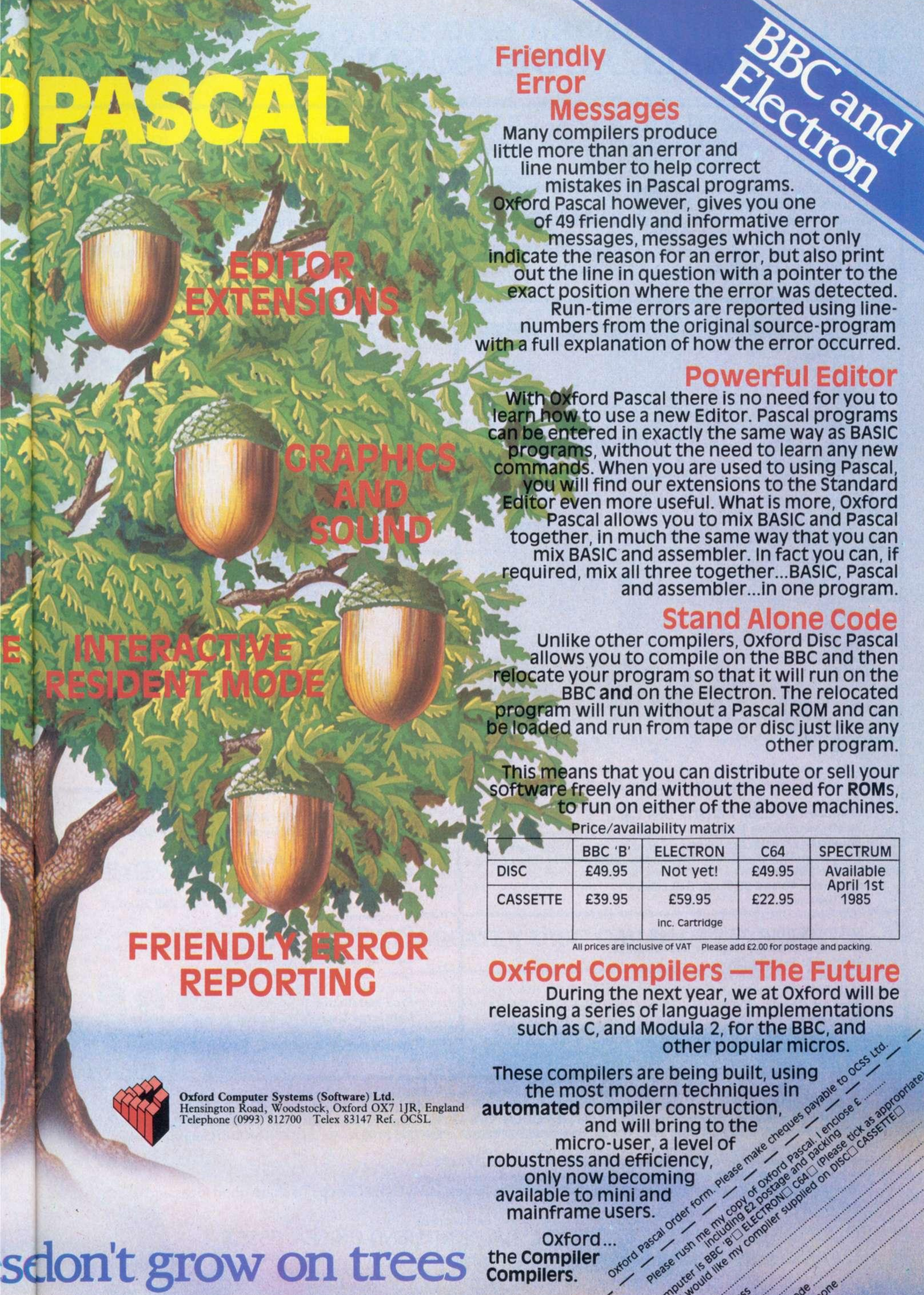
Resident and Disc Compiler
Oxford Pascal comes in two forms:

For Tape Users...Oxford Resident Pascal a compiler located largely in ROM which is available at any time. Programs can be written and compiled on the spot without disc or tape access, and compilation is fast enough to make using the compiler much like using the BASIC interpreter. Thus, learning Pascal is a simple interactive process. Some 15K of memory is available for user programs, the remainder being reserved for compiled object code.

For Disc Users...Oxford Disc Pascal offers all the above PLUS...a full disc compiler which is capable of using the WHOLE memory for Pascal object code, it is supplied with a powerful LINKER, allowing you to break large programming tasks down into separately compilable, easily-manageable files.

Manual
Both these compilers come with a manual which has been carefully designed, not only as a quick reference guide, but also as a full tutorial for those new to Pascal.

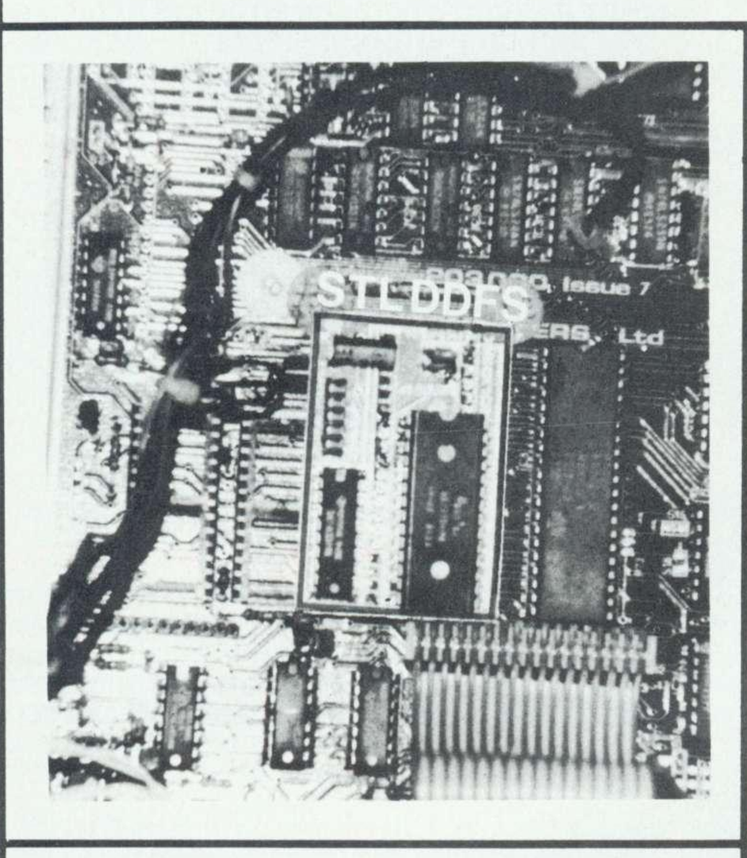


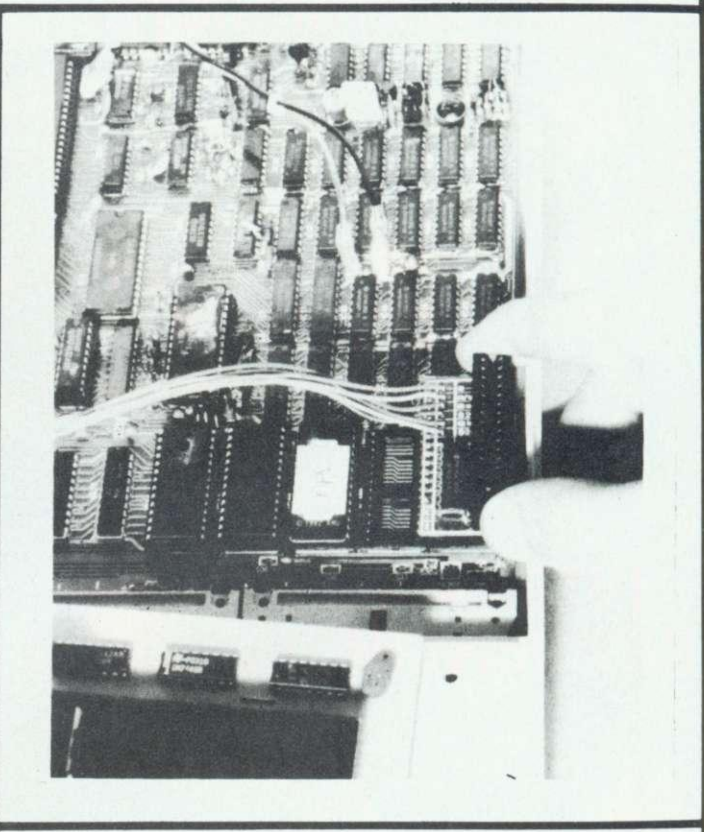


	BBC 'B'	ELECTRON	C64	SPECTRUM
DISC	£49.95	Not yet!	£49.95	Available April 1st 1985
CASSETTE	£39.95	£59.95 inc. Cartridge	£22.95	

FROM SMALL ACORNS, SOLIDISK GROWS.

IN JULY 1983, we released the Sideways RAM for the BBC computer. We sold 5 in the first week, 10 in the second week, 20 in the third and one year later, we sell more than 500 in the UK and well more than 100 a week abroad.
By the time you read this, more than 30,000 Solidisk Sideways RAM boards will be beavering away in hundreds of schools and thousands of homes.
They are being joined by thousands of Solidisk DDFS each month. Soon, we hope, they will all be linked together by Solidisk Single Chip MODEM.
To support the users, a network of Solidisk Local Experts, covering the UK, Holland, France, Australia and Israel has been set up and expanding. Providing fitting and software.





SOLIDISK DOUBLE DENSITY DFS 1.5:
Single and Double Density.
Automatic Density Selection.
1 or Twin Drives, 40 and 80 Tracks, Single and Double Sided.
Automatic 40 and 80 Track Selection.
31 Filenames.
Low Cost.

SOLIDISK DOUBLE DENSITY DFS 2.0:
Virtually Unlimited Number of Filenames.
Automatic Tape to Disk.
Built-in Disk Fix and Disk Sector Editor.
Built-in Wordprocessor.
Does not Require DNFS With Z80 and 6502 Second Processors.

SOLIDISK SIDEWAYS RAM:
Add from 16k to 256k bytes of RAM to the BBC 32k RAM.
Useable for running Sideways ROM Software.
Useable in Networks or on BBC with Disk Drive(s).
Compatible With All Acorn Existing Products.
Including Econet, Teletext, 6502 and Z80 Second Processors.
Compatible With Most Sideways ROM Software.
Available Multi User Licencing Agreement from Leading Software Houses.
Easily Expandable as Your Needs Grow.
Low Cost.
Free Installation if Required.
Very large User Base, Extensive Free Software.
Local Help by Solidisk Local Expert Network.
Free Membership to receive Periodic Newsletters.

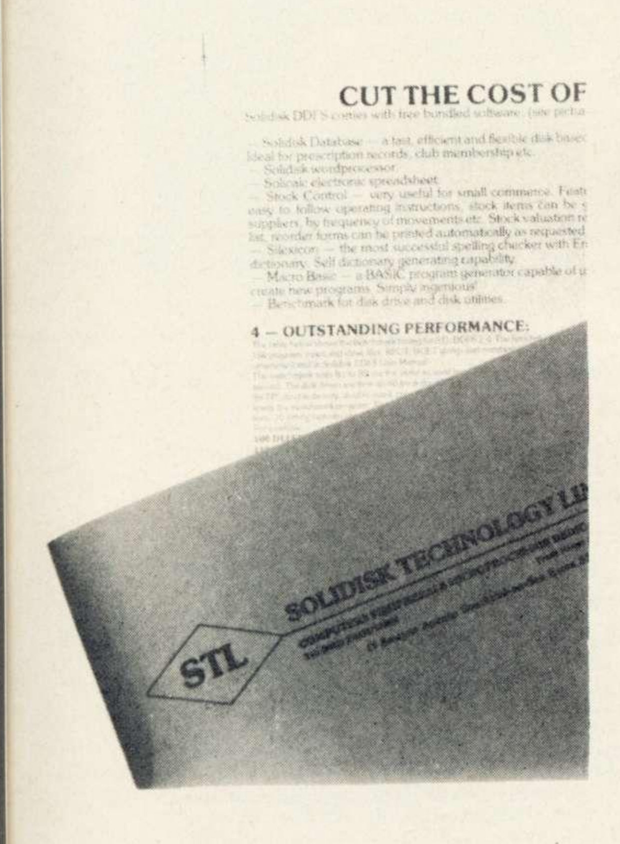
COMING SOON:
SOLIDISK is at present developing a state of the art MODEM. This will be compatible with the CCITT V23 and BELL 202 transmission standards at speeds from 5 to 1200 Bauds and will be based on the TMS 3105 single chip FSK MODEM manufactured by TEXAS Instruments.
The price is expected to be £39.95 inclusive of VAT.

We need you and your help. To make Solidisk Users the largest BBC Users Group. To share good ideas and good ways to use them.

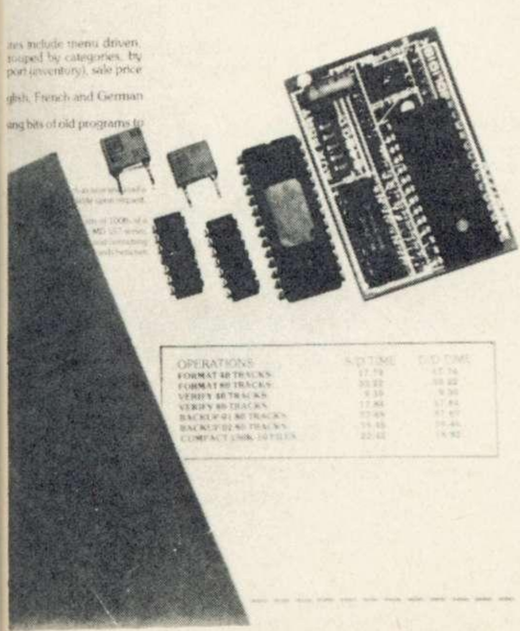
SOLIDISK TECHNOLOGY, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX
TEL. (0702) 354674 (10 lines).

HAVE YOU ALREADY GOT DISK DRIVE(S) FOR YOUR BBC COMPUTER?

OPERATIONS	S/D TIME	D/D TIME
FORMAT 40 TRACKS:	17.74	17.74
FORMAT 80 TRACKS:	33.22	33.22
VERIFY 40 TRACKS:	9.30	9.30
VERIFY 80 TRACKS:	17.84	17.84
BACKUP 01 80 TRACKS:	37.69	37.69
BACKUP 02 80 TRACKS:	39.46	39.46
COMPACT 100K-10 FILES	22.42	18.82



RUNNING YOUR MACHINE



THE SOLIDISK DOUBLE DENSITY DFS

If you take your Disk Systems seriously then there are very few viable alternatives to our new Double Density Filing System.

Anyone, with their ear to the ground, will probably have heard of the great shortage of the 8271 Floppy Disk Controller chip. This chip is, of course, the basis of all single density DFS upgrades for the BBC Microcomputer and is used extensively by Acorn, AMCOM and Watford Electronics in their respective DFS's.

This shortage can mean long delays or paying much inflated prices to obtain your Disk Upgrade.

Now, however, we at SOLIDISK have developed an alternative system with many advantages over the 8271 based upgrades. Not the least of these being continuation of supply of the FDC chip (Western Digital 1770) but, also, improvements in the speed and versatility of operation.

EASY TO INSTALL

The SOLIDISK DDFS comes complete with an easy to follow manual with step by step installation instructions, and can be fitted in just a few minutes by anyone with just the barest knowledge of the insides of their BBC.

The DFS contains just 4 IC's and 2 jumpers to be inserted and one link to be cut in the computer. This is compared to the usual upgrades which require 11 IC's to be fitted and the link to be cut.

EASY TO USE

The SOLIDISK DDFS Revision 1.5 contains many time and labour saving features. These include formatter, verifier, automatic density sensing, automatic 40/80 track switching and Single/Double Density mass copying etc.

COMPLETE CONTROL OVER THE DISK

SOLIDISK DDFS gives you complete control over your disk drive(s). You can use any combination of Single/Double Density, 40 or 80 tracks in one or two disk drives.

Every time the SOLIDISK DDFS accesses the disk it detects the density and the disc size in use and acts accordingly.
You can for example copy from a 40 to an 80 track disc on the same 80 track disk drive or even format a 40 track disk in an 80 track drive using the automatic disc size sensing in the DDFS. It is also possible to have one side of a disc formatted in Single Density and the other side in Double Density. Also copying between different densities is coped with automatically and, when using twin drives, is very fast.

GREATER DISC CAPACITY

When formatting a disk with the SOLIDISK DDFS you have a choice of the usual Single Density or the increased capacity Double Density.

Formatting in Single Density will leave your disk compatible with all other Single Density systems. However if the disk is formatted in Double Density it will have a 60% greater capacity than the equivalent size Single Density disk. This means that on an 80 track disk that the capacity is increased from the usual 400 kbytes to 640 kbytes of storage. The Double Density Format used is, at present, unique to the SOLIDISK DDFS and provides 16 sectors per track as opposed to the usual 10 sectors in Single Density giving a 40% saving in media surface for a file of given length over Single Density.

INCREASED SPEED OF OPERATION

As mentioned previously a disk formatted in Double Density uses about 40% less disk space per given length of file than does a disk formatted in Single Density or alternatively it holds 60% more information per track. This allows the, already fast, SOLIDISK DDFS to run very fast in the Double Density mode as demonstrated in the benchmark test on the next page.

BENCHMARK OUTSTANDING PERFORMANCE:

The table below shows the benchmark timing for STL DDFS 1.4. The benchmark consists of disk operations such as save and load a 16k program, open and close files, BPUT, BGET strings and numbers, format and verify a disk etc., and is available upon request, otherwise listed in Solidisk DDFS User Manual.

The benchmark tests B1 to B9 are the same as used by many reviewers. The time is expressed in seconds and parts of 100th of a second. The disk drives are twin 40/80 track double sided MITSUBISHI M4853, the diskettes are Verbatim Datalife MD 557 series, 96 TPI, double density, double sided, preverified to ensure that the media is free of all error and mechanical defects and containing solely the benchmark program. The test is loaded into memory, the drive motors are allowed to stop completely 2 seconds between tests, 10 timing samples are taken and the mean time is calculated automatically.
For example:

```
100 DEFFNb1:REM Save a 16k program.
110T% ÷ TIME
120 *SAVE A 8000 +4000
130 ÷ TIME — T%
```

Full listings are included in the User Manual.
This FN is called 10 times with 3 sec. interval, the mean result is printed as 'B1'.

BENCHMARK DESCRIPTION	S/D TIME	D/D TIME
B1 Save 16k	2.62	1.43
B2 Load 16k	2.45	1.23
B3 Openin and close 100 times	20.70	20.16
B4 Openout and print 1000 numbers (255)	5.84	4.66
B5 Openin and input 1000 numbers (255)	4.72	4.14
B6 Openout and print 100 80 bytes strings	6.18	4.91
B7 Openin and input 100 80 bytes strings	4.90	4.31
B8 BPUT 100 bytes (255)	3.01	2.06
B9 BGET 1000 bytes (255)	1.88	1.52

Note 1: Whenever a file is to be opened, STL DDFS automatically refreshes the disk directory, thus preventing erroneous disk change. Many other DFS's do not take the same care, although yielding a much shorter time, and this could accidentally stop the program.

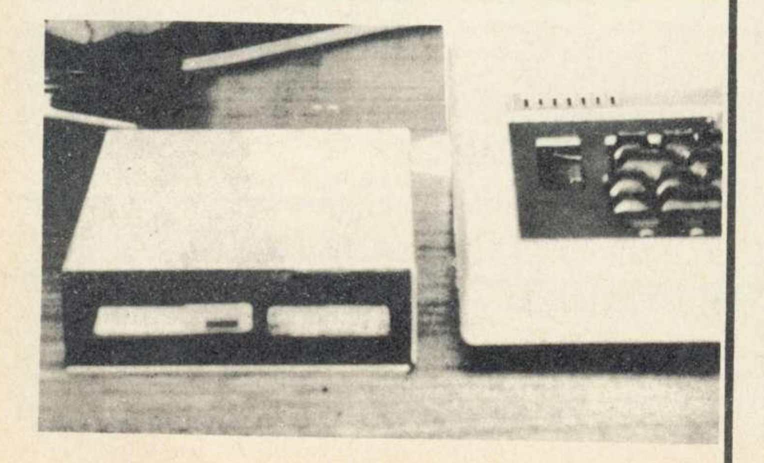
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BACKUP 01 80 TRACKS:	37.69	37.69
BACKUP 02 80 TRACKS:	39.46	39.46
COMPACT 100K 10 FILES	22.42	18.82

With Wordwise:
Load 2000 words (17811 bytes) 16.80 sec. (41.40 sec. with AC).
With Scribe:
Count 2000 words (17811 bytes) 4.20 sec. (9.80 sec. with AC.90 DFS)
With Beebug's Masterfile:
Sort records 1 to 20 in PEOPLE sample database, the database is presorted on field 2 then the program is asked to sort on field 1, the time is then taken: 56.23 sec. (127.86 sec. with AC.90 DFS).
These timings are improved even further in double density mode.

The figures speak for themselves.

STL DDFS dramatically increases the operating speed of your software, including wordprocessors like Wordwise, View, Scribe, databases like Masterfile, Starbase etc.

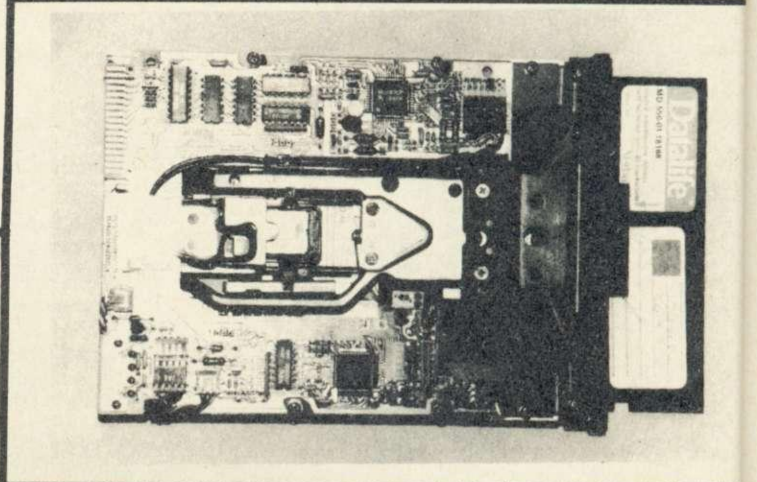
Solidisk engineers won't stop there.



MITSUBISHI DISK DRIVE:
From the new VLSI ultra quiet auto spin-up series comes the MITSUBISHI M4853. We have chosen it for its speed, quiet performance, low power consumption and state of the art design — look at the following features:
— new developments by Motorola and Mitsubishi largely reduce the area taken up by electronics, leaving more room for the diskette. This in turn implies lower noise levels and reduced friction on diskettes.

8 Slim 5.25" half height model attractively cased in BBC micro beige
— Reliability; we find that Mitsubishi compares most favourably with other makes
— Use your BBC own power supply —
— Single and double density available, plus ability ro read 40 track diskettes formatted elsewhere when used with our DFS.

Of course, we don't need to mention that all drives come complete with Dual leadds letting you add instantly a second disk drive and manual together with full guarantee on parts and labour.



EXTRA FEATURES OF SOLIDISK DDFS 2.0

With the production of the SOLIDISK DDFS 2.0 ROM we raise the already high standard of the previous DDFS 1.5 ROM.

The larger memory capacity of the DDFS 2.0 has allowed inclusion of a Wordprocessor and complete Disk Toolkit as well as a totally new concept in the working of the Disk Directory.

This will, we feel, make the SOLIDISK DDFS 2.0 ROM the most powerful Disk System currently available.

1) EXTENDED NUMBER OF FILENAMES
The standard number of filenames on the BBC microcomputer is limited to 31on most Single Density DFS's. This usually presents no problem on a system using 40 track drives but when using either 80 track drives and/or a Double Density Filing System this number will quite often be reached with a lot of the disk space still unused.

The SOLIDISK DDFS 2.0 ROM uses a unique and novel way to circumvent this shortcoming as every time a catalogue becomes full a new one is created. This gives the possibility of having up to 1502 filenames on a normal 80 Track Double Sided disk. Even with this large number of filenames worst case access taking only just over 2 seconds. Obviously with large files and a lesser number of filenames the access time decreases dramatically.

The way that the DDFS 2.0 ROM operates means that ordinary single catalogue discs are completely compatible with our system and, indeed, will be upgraded to multi catalogue once the number of filenames exceeds 31. This means no special formatting is necessary and that the disc remains compatible with other Single Density DFS's.

2) DISK TOOLKIT
Included on the SOLIDISK DDFS 2.0 ROM is a powerful disk repair facility. It is possible to read a complete track into memory and to repair or modify the data before restoring the track to the disk. If only one sector needs to be worked on then this too is possible with the Disk Sector Editor contained in the DDFS 2.0.

A powerful Disk Copy routine is also included to allow mmost non-standard format disks to be duplicated. This routine will also displaay the Sector I.D. Fields so that it is possible to see the makeup of the track being copied.

3) WORDPROCESSOR:
SOLIDISK DDFS 2.0 ROM contains a Word Processor with many excellent features such as 80 column screen, automatic on screen justification, Search and Replace, Block Move and Copy etc.

SOLIDISK+MITSUBISHI BIG DEAL:

This is exactly what you would receive:

— one double sided 80 track Mitsubishi M4853 disk drive, cased in beige.
— one Solidisk Double density disk interface (complete with STL DDFS 1.5 ROM) as described overleaf, giving a total capacity of 640K.
— Dual leads and instruction manual.
— 5 Software Diskettes containing a selection of the most prestigious programs written for the BBC.
— full one year guarantee.
—all for £209.95 including VAT and post and packing.

THE HARDWARE:
As described earlier and opposite.

THE SOFTWARE:
A selection of 6 programs based on ease of use, and popularity. All efforts are made so that you would not have to read the manual twice.
All programs feature on screen help (word processor) or option menus throughout. Mode 3 is used throughout whenever possible for good visual representation.

— Solicalc —
A Disc Based electronic spreadsheet made only possible with the speed of Solidisk DDFS. The sheet size can be as big as 170 kbytes. Written in modules, it is easily upgradable. Mode 3 screen. Goto, Calculate, Replicate, Automatic Header etc.

— Solidisk Datafile —
A fast, efficient and random access Database. Solidisk Datafile features:
— Compact size.
— 80 column screen throughout.
— 15 fields of 60 characters per card.
— Unlimited number of cards.
— Powerful Screen Editing allowing VERY FAST data entry on new cards or data correction on old cards.
— All Maths functions on ALL fields admitting Symbolic Variables (like A, B, C, D etc) for entering formulae.
— Special SORT program making use of any free disk space to avoid swapping cards.
— Standard options include View, Print using Tabulation, Print Labels, Search on any number of criteria and repeat on count, Amend, Create, Spool to disk, Append and Mailmerge with Solidisk Word Processor (requires EPSON compatible printer).
— Ability to read BEEBUG's Masterfile and possibly other systems later on.

— Solidisk wordprocessor —
On screen help, Wordstar style cursor editing and control keys, on screen justification while you type, Block commands, Quick commands and dot commands for mailmerge. Future development will allow reading Wordstar text from the Z80 second processor. Solidisk can offer Laser Typesetting and Page Planning service: it costs you only £1.00 for typesetting 1×A4 page (around 4,000 characters) from disk received by MODEM.

— Stock control —
useful for small businesses. Features include menu driven, easy to follow instructions, easy categorising. Stock evaluation reports and inventories, together with price lists and reorder forms can be printed automatically as requested.

— Silexicon — the most successful spelling checker with English, French and German dictionaries, together with self generating capability.

— Macrobasic —
a BASIC program generator capable of using bits of old programs to create new ones. Clever ideas — clever ideas of making them work!

Please note that this software is only free as prt of the package deal. It is otherwise avaiable at a cost of £14. Customers who would prefer the DFDC version of our disk filing system (see earlier) can purchase the package deal with this option for an extra £10.
What we may need to tell you is that the price is also agreeably low — check what we offer against any of our competitors — which all adds up to a high degree of sophistication affordable to students and businessmen alike.

WE SHALL ENDEAVOUR TO DELIVER WITHIN 48 HOURS ON CREDIT CARD SERVICE: RING SOUTHEND (0702) 354674 (10 lines)

SOLIDISK LOCAL EXPERTS

We have local people able to fit your equipment FREE OF CHARGE in all of the following towns. If your area is not mentioned ring the office!

BASILDON
BEXLEY
BIRMINGHAM
BOSTON
COVENTRY

HODDESDON
KINGSTON
LEIGHTON BUZZARD
LIVERPOOL
LONDON

NEW MALDEN
NEWTOWNARDS

NOTTINGHAM
PETERBOROUGH
READING
SHEFFIELD

TODDINGTON
WARDLE
WANTAGE
WIMBORNE
WOKING
WALES

PRICE LIST — INCLUDES VAT & P&P

	£
SIDEWAYS RAM:	
SWR16 16K ADD-ON	43.65
SWR32 32K ADD-ON	59.95
S/D128 128K ADD-ON	150.95
S/D256 256K ADD-ON	N/A 256.00
EXTENSIONS:	
16-32K FULL EXCHANGE	19.00
16-128K FULL EXCHANGE	110.00
32-128K	95.00
SOLIDISK DFS:	
STL DDFS DISK UPGRADE	39.95
STL DFDC (goes with Acorn DFS)	49.95
DISK DRIVES:	
MITSUBUSHI 2×80 (INC LEADS	163.00
MITSUBUSHI TWIN + MANUAL)	323.00
ҪOMPLETE SYSTEMS: (ie. DRIVES + DDDFS)	
MITSUBISHI 2×80	200.99
MITSUBISHI TWIN	353.00
CPU	
65-C-02 CHIP	12.00
65-C-02+ SOFTWARE	14.00
EPROM EQUIPMENT	
2764 CHIP	8.00
5 × 2764 PACK	36.00
3 × 27128 PACK	39.95
EPROM PROGRAMMER	20.95
EPROM ERASER — UVIPAC	20.95
DATALIFE DISKS	
MD525 SS/DD 40TRK	17.00
MD550 DS/DD 40TRK	23.00
MD577 SS/DD 80TRK	23.00
MD557 DS/DD 80TRK	29.00
WAB M16A DS/DD 80TRK	24.00
SANYO COLOUR MONITORS	
14" — NORMAL RESOLUTION	210.00
MEDIUM RESOLUTION	310.00
HIGH RESOLUTION	410.00
EPSON PRINTERS	
RX80 MATRIX PRINTER	248.35
RX80FT MATRIX PRINTER	282.85
FX80FT MATRIX PRINTER	386.35
BBC PRINTER CABLE	9.00
ELECTRON DISK INTERFACE	40.95
Typesetting per A4	1.00

TO: SOLIDISK 17 SWEYNE AVENUE SOUTHEND-ON-SEA ESSEX SS2 6JQ
Please send me:

QUANTITY	ITEM	TOTAL
....	....	£............
....	....	£............
....	....	£............

MY BARCLAY/ACCESS CARD NO. IS ....

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ADDRESS: ....

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INTRODUCING THE DFDC!

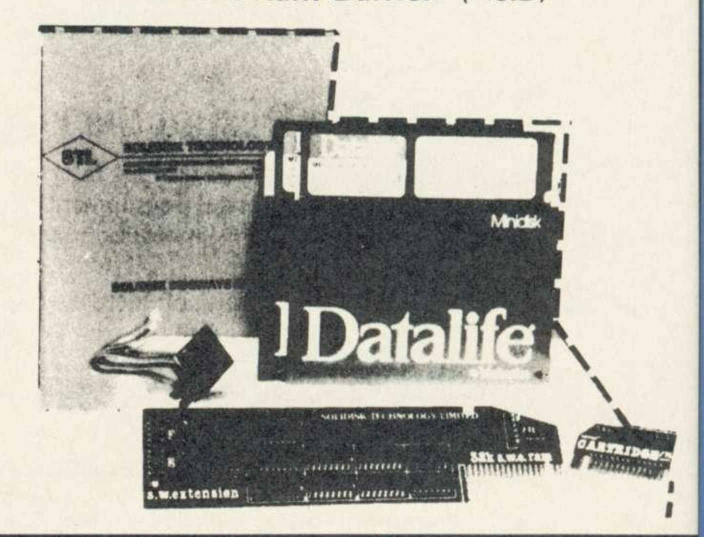
For those who already have the Acorn DDFS installed in their computer and would like the advantages of increased speed and storage capacity that Double Density systems offer SOLIDISK have introduced a totally new concept in the shape of the DFDC!

The DFDC board simply sits in place of the 8271 FDC, this being reinstalled in the DFDC boaard. Now all that needs to be done is to install the DDFS ROM into a Rom Socket, to the right of the existing Acorn DFS, and two other minor connections.

Great Value at £49.95 inc.

HAS YOUR BBC COMPUTER GOT ITS SIDEWAYS RAM BOARD YET?

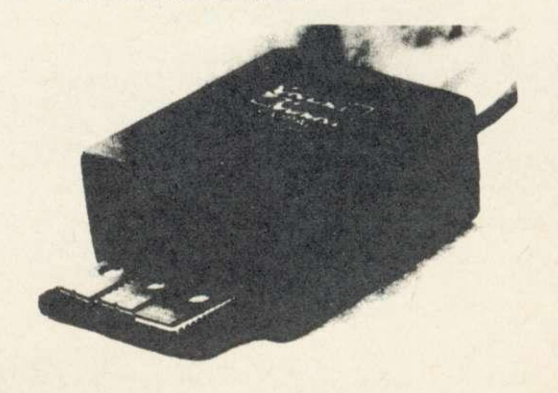
"Break the Ram Barrier" (A&B)



HOW TO ORDER?

You can order any item using the coupon. Prices are inclusive of VAT, post and packing. Access and Barclay card holders can place their order by phone.
Educational authorities, Acorn dealers and OEMs can obtain quantity discounts.

OTHER PRODUCTS FROM SOLIDISK:
UVIPAC EPROM ERASER:



DISKING
means business

DISKING FREEPOST, LIPHOOK, HAMPSHIRE GU30 7BR, UNITED KINGDOM
How to contact us:
General Enquiries & Sales (0428) 722563; Trade/Government (0428) 722840; Telex 858623 Telbur G

DISKING NEWS

THE DISKING PROMISE. If you don't find us the slickest diskette supplier in the world, or if you have ANY reason to be unhappy with our products OR services in ANY way — we want to know. After all we are here to serve you, and if you're not happy — we're not happy. We continuously strive for perfection, and everything you see here is IN STOCK and ready to be shipped within four hours (YES, HOURS!). A full refund if dissatisfied goes without saying.

NEW FROM DISKING. To brighten up your office desk, just pick up the 'phone and order your very own SUPERB Colour Coded diskettes. We have *RED, ORANGE, YELLOW, GREEN, PALE BLUE* and BLUE. They are packed in fives of one colour, and come with a *FREE* SEE 10 Library Box, and pack of Colour Coders. So before you erase the wrong disk or accidentally leave the master disk out in the dusty environment — *COLOUR CODE THEM!*.

THE DISKING BD (British Disease) AWARD. *Our BD award this week for another useless company, goes to Corralls (Powell Duffryn Fuels Ltd), who, when asked for an urgent delivery of heating oil that we required, answered "We cannot give you a delivery time, and we cannot give you a price, I'm only here to take orders". If any of you out there understand that, we'd love to hear from you?*

DISKETTES





Dysan

Maxell — The Gold Standard

5¼″ Diskettes
Prices and quantities relate to ***Ten-Packs***

Prices exc VAT	1-4	5-9	10+
MD1-D S/S 48 tpi	23.90	22.90	21.90
MD2-D D/S 48 tpi	34.90	33.90	32.90
MD1-DD S/S 96 tpi	34.90	33.90	32.90
MD2-DD D/S 96 tpi	42.90	41.90	40.90

Certified for single OR double density. 48 tpi suitable for 35 or 40 track operation. 96 tpi suitable for 77 or 80 track operation.

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FD1-XD S/S D/Dens	32.90	31.90	30.90
FD2-XD D/S D/Dens	40.90	39.90	38.90

32 hard sector available at the same prices.

3½″ Microdisks
Prices and quantities relate to ***Ten-Packs***

Prices exc VAT	1-4	5-9	10+
MF2-DD D/Sided 1.0Mb	59.90	58.90	57.90

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Prices and quantities relate to ***Ten-Packs***

Prices exc VAT	1-4	5-9	10+
CF2 Compact D/S Floppy	39.90	38.90	37.90

Dysan for the Discerning

5¼″ Diskettes
Prices and quantities relate to ***Ten-Packs***

Prices exc VAT	1-4	5-9	10+
104/1D S/S 48 tpi	23.90	22.90	21.90
104/2D D/S 48 tpi	34.90	33.90	32.90
204/1D S/S 96 tpi	34.90	33.90	32.90
204/2D D/S 96 tpi	42.90	41.90	40.90

Certified for single OR double density. 48 tpi suitable for 35 or 40 track operation. 96 tpi suitable for 77 or 80 track operation.

8″ Diskettes
Prices and quantities relate to ***Ten-Packs***

Prices exc VAT	1-4	5-9	10+
3740/1D S/S D/Dens	32.90	31.90	30.90
3740/2D D/S D/Dens	40.90	39.90	38.90

32 hard sector available at the same prices

MEMOREX
Memory Excellence

5¼″ Diskettes
Prices and quantities relate to ***Ten-Packs***

Prices exc VAT	1-4	5-9	10+
3481 S/S 48 tpi	22.90	21.90	20.90
3491 D/S 48 tpi	29.90	28.90	27.90
3504 S/S 96 tpi	28.90	27.90	26.90
3501 D/S 96 tpi	36.90	35.90	34.90

Certified for single OR double density. 48 tpi suitable for 35 or 40 track operation. 96 tpi suitable for 77 or 80 track operation.

5¼″ Diskettes (HIGH DENSITY)
Prices and quantities relate to ***Ten-Packs***

Prices exc VAT	1-4	5-9	10+
5500 D/S 1.6 MByte	49.90	48.90	47.90

3½″ Microdisks
Prices and quantities relate to ***Ten-Packs***

Prices exc VAT	1-4	5-9	10+
6100 S/Sided 0.5Mb	42.90	41.90	40.90



coloured diskettes

5¼″ Supplied in *Five-Packs* of one colour
Prices and quantities relate to ***Five-Packs***

Prices exc VAT	1-9	10-19	20+
1D S/S 48 tpi	12.90	11.90	10.90
2D D/S 48 tpi	18.90	17.90	16.90
1DD S/S tpi	18.90	17.90	16.90
2DD D/S 96 tpi	21.90	20.90	19.90

To order the colour of your choice, just precede the type number with the appropriate letter, (R) RED, (O) ORANGE, (Y) YELLOW, (G) GREEN, (B) BLUE & (P) PALE BLUE. For the actual colours, please see our full colour advertisement back a couple of pages, or call and ask for our full colour brochure.





Verbatim Datalife = Best!

5¼″ Diskettes
Prices and quantities relate to ***Ten-Packs***

Prices exc VAT	1-4	5-9	10+
MD 525-01 S/S 48 tpi	22.90	21.90	20.90
MD 550-01 D/S 48 tpi	29.90	28.90	27.90
MD 577-01 S/S 96 tpi	28.90	27.90	26.90
MD 557-01 D/S 96 tpi	36.90	35.90	34.90

Certified for single OR double density. 48 tpi suitable for 35 or 40 track operation. 96 tpi suitable for 77 or 80 track operation.

8″ Diskettes
Prices and quantities relate to ***Ten-Packs***

Prices exc VAT	1-4	5-9	10+
FD 34-9000 S/S S/D	31.90	30.90	29.90
FD 34-8000 S/S D/D	31.90	30.90	29.90
DD34-4001 D/S D/D	36.90	35.90	34.90

32 Hard Sector available at same price.

3½″ Microdisks
Prices and quantities relate to ***Ten-Packs***

Prices exc VAT	1-4	5-9	10+
MF350 S/Sided 0.5Mb	42.90	41.90	40.90

Verbatim Verex = Value

5¼″ Diskettes
Prices and quantities relate to ***Ten-Packs***

Prices exc VAT	1-4	5-9	10+
MD200-01 S/S 48 tpi	19.90	18.90	17.90
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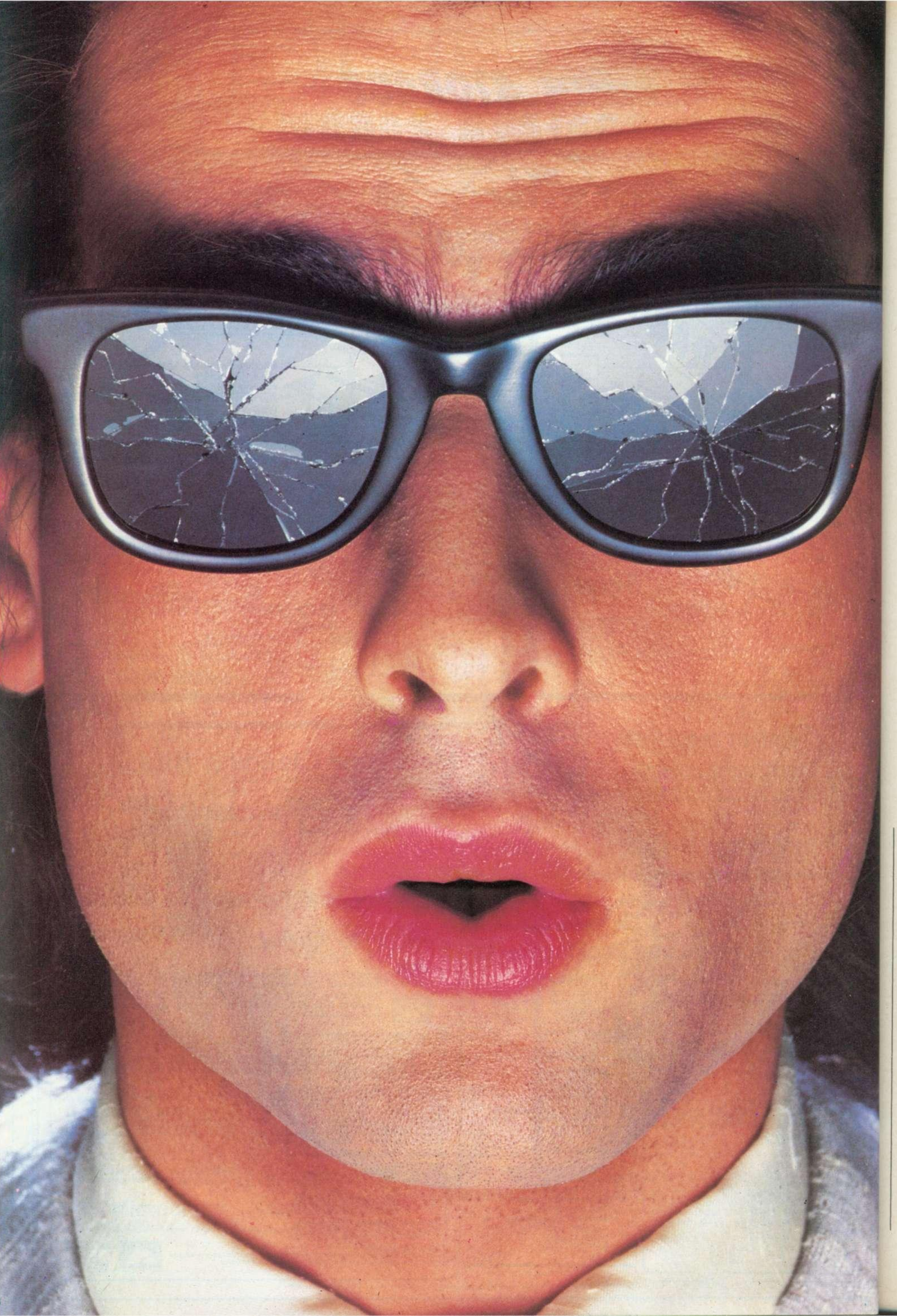
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Luton. Hobbyte, Unit 16, The Arndale Centre. Tel: 0582 457195.
Luton. Laskys, 190-192 Arndale Centre. Tel: 0582 38302.
Luton. Terry More, 49 George Street. Tel: 0582 23391.

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Reading. Laskys, 118-119 Priar St. Tel: 0734 595459.
Slough. Data Supplies, Templewood Lane, Farnham Common. Tel: 2 820004.
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Middlesbrough. Boots, 88-90 Linthorpe Road, The Cleveland Centre. Tel: 0642 249616.

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Penrith. Penrith Communications, 14 Castlegate. Tel: 0768 67146.
Whitehaven. P D Hendren, 15 King Street. Tel: 0946 2063.
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Alfreton. Gordon Harwood, 67-71 High Street. Tel: 0733 836781.
Chesterfield. Boots, 35-37 Low Pavement, Market Place. Tel: 0246 203591.
Chesterfield. Computer Stores, 14 Stephenson Place. Tel: 0246 208802.
Derby. Boots, 1 Devonshire Walk. Tel: 0322 45886.

DEVON

Exeter. Boots, 251 High Street, Tel: 0392 32244.
Exeter. Open Channel, Central Station, Queen Street. Tel: 0392 218187.
Paignton. Computer Systems Ltd, 35 Hyde Road. Tel: 0803 524284.
Plymouth. Syntax, 76 Cornwall Street. Tel: 0752 28705.
Seaton. Curtis Computer Services, Seaton Computer Shop, 51c Harbour Road. Tel: 0297 22347.
Tiverton. Actron Microcomputers, 37 Bampton Street. Tel: 0884 252854.

DORSET

Bournemouth. Brook Computers, 370 Charminster Road. Tel: 0202 533054.
Bournemouth. Lansdowne Computer Centre, 1 Lansdowne Crescent, Lansdowne. Tel: 0202 20165.
Dorchester. The Paper Shop, Kings Road. Tel: 0305 64564.
Poole. Lansdowne Computer Centre, 14 Arndale Centre. Tel: 0202 670901.

ESSEX

Basildon. Basildon Software Centre, 78-80 Liberty Shopping Hall, East Square. Tel: 0268 27922.
Chelmsford. Maxton Hayman, 5 Broomfield Road. Tel: 0245 354595
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Colchester. Boots, 5-6 Lion Walk. Tel: 0206 577303.
Grays. H. Reynolds, 28a Southend Road. Tel: 0375 31641.
Harlow. Harlow Computer Centre, 17 Staple Tye. Tel: 0279 22846.
Harlow. Laskys, 19 The Harvey Centre. Tel: 0279 443495.
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Southend-on-Sea. Computerama, 88 London Road. Tel: 0702 335443.
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Watford. Laskys, 18 Charter Place. Tel: 0923 31905.
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Watford. Watford Electronics, Cardiff Road. Tel: 0923 405588.
Welwyn Garden City. DJ Computers, 40 Fretherne Road. Tel: 96 28444.

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Ashford. Geerings of Ashford, 80 High Street. Tel: 0233 33366.
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Bromley. Boots, 148-154 High Street. Tel: 01-460 6688.
Bromley. Computers Today. 31 Market Square. Tel: 01-290 5652.
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Bromley. Walters Computers, Army & Navy, 64 High Street. Tel: 01-460 9991.
Chatham. Boots, 30-34 Wilmott Square, Pentagon Centre.

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Gravesend. Gravesend Home Computers, 39 The Terrace. Tel: 0474 23871.
Gillingham. Regal Software Supplies, 49 High Street. Tel: 0634 579634.
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Shortlands. The Village House of Computers, 87 Beckenham Lane. Tel: 01-460 7122.
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Tunbridge Wells. Modata Computer Centre, 28-30 St. Johns Road. Tel: 0892 41555.

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Blackburn. Tempo Computers, 9 Railway Road. Tel: 0254 691333.
Blackpool. Blackpool Computer Store, 179 Church Street. Tel: 0253 20239.
Burnley. IMO Business Systems, 39-43 Standish Street. Tel: 0282 54299.
Preston. 4Mat Computing, 67 Friargate. tel: 0772 561952.
Preston. Laskys, 1-4 Guildhall Arcade. Tel: 0772 24558.
Wigan. Wildings Computer Centre, 11 Mesnes Street. Tel: 0942 22382.

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Leicester. Boots, 30-36 Gallowtree Gate. Tel: 0533 21641.
Market Harborough. Harborough Home Computers, 7 Church Street. Tel: 0858 63056.

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W1. Computers of Wigmore Street, 104 Wigmore Street. Tel: 01 486 0373.
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W1. Lion House, 227 Tottenham Court Road. Tel: 01-637 1601.
W1. Sonic Foto Micro Center, 256 Tottenham Court Road. Tel: 01-580 5826.
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W1. Walters Computers, DH Evans, Oxford Street. Tel: 01-629 8800.
WC1. Transam Micro Systems, 59-61 Theobalds Road. Tel: 01-405 5240.
W8. Walters Computers, Barkers, Kensington High Street. Tel: 01-937 5432.
SE7. Vic Oddens Micros, 5 London Bridge Walk. Tel: 01-403 1988.
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Lewisham. Laskys, 164 High Street. Tel: 01-852 1375.
SE15. Castlehurst Ltd, 152 Rye Lane, Peckham. Tel: 01-639 2205.
EC2. Devron Computer centre, 155 Moorgate. tel: 01-638 3339.
N14. Logic Sales, 19 The Bourne, The Broadway, Southgate. Tel: 01-882 4942.
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NW3. Maycraft Micros, 58 Rosslyn Hill, Hampstead. Tel: 01-431 1300.
NW4. Davinci Computer Store, 112 Brent Street, Hendon. Tel: 01-202 2272.
NW7. Computers Inc, 86 Golders Green. Tel: 01- 209 0401.
NW10. Technomatic, 17 Burnley Road, Wembley. Tel: 01-208 1177.

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Bolton. Computer World UK Ltd, 208 Chorley Old Road. Tel: 0204 494304.
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Manchester. NSC Computer Shops, 29 Hanging Ditch. Tel: 061-832 2269.
Manchester. Walters Computers, Kendal Milne, Deansgate. Tel: 061-832 3414.
Oldham. Home & Business Computers, 54 Yorkshire Street. Tel: 061-633 1608.
Swinton. Mr Micro, 69 Partington Lane. Tel: 061-728 2282.

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Heswall. Thornguard Computer Systems, 46 Pensby Road. Tel: 051-342 7516.
Liverpool. Hargreaves, 31-37 Warbreck Moor, Walton. Tel: 051-525 1782.
Liverpool. Laskys, Dale Street. Tel: 051-236 3298.
Liverpool. Laskys, St. Johns Precinct. Tel: 051-708 5871.
St. Helens. Microman Computers, Rainford Industrial Estate, Mill Lane Rainford. Tel: 0744 885242.
Southport. Central Studios, 38 Eastbank Street. Tel: 0704 31881.

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Enfield. Laskys, 44-48 Palace Garden Shopping Centre. Tel: 01-363 6627.
Harrow. Camera Arts, 42 St. Anns Road. Tel: 01-427 5469.
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Hounslow. Boots, 193-199 High Street. Tel: 01-570 0156.
Southall. Twillstar Computers Ltd, 7 Regina Road. Tel: 01-574 5271.
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Twickenham. Twickenham Computer Centre, 72 Heath Road. Tel: 01-892 7896.
Uxbridge. JKL Computers, 7 Windsor Street. Tel: 0895 51815.

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Norwich. Adams, 125-129 King Street. Tel: 0603 22129.

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Sutton in Ashfield. HN & L Fisher, 87 Outram Street. Tel: 0623 54734.
Nottingham. Laskys, 1-4 Smithy Row. Tel: 0602 413049.

OXFORDSHIRE

Abingdon. Ivor Fields Computers, 21 Stern Street. tel: 0235 21207.
Banbury. Computer Plus, 2 Church lane. Tel; 0295 55890.
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Oxford. Science Studio, 7 Little Clarendon Street. Tel: 0865 54022.

SCOTLAND

Aberdeen. Boots, 133-141 Union Street. Tel: 0224 585349.
Edinburgh. Boots, 101-103 Princes Street. Tel: 031-225 8331.
Edinburgh. Laskys, 4 St. James Centre. Tel: 031-556 1864.
Glasgow. Boots, 200 Sauchiehall Street. Tel; 041-332 1925.
Glasgow. Boots, Union Street and Argyle Street. Tel; 041-248 7387.
Glasgow. Tom Dixon Cameras, 15-17 Queen Street. Tel: 041-204 0826.

SHROPSHIRE

Shrewsbury. Clairmont Enterprises, Hills Lane. Tel: 3647 52949.
Shrewsbury. Computerama, 13 Castlegate. Tel: 0743 60528.
Telford. Computer Village Ltd, 2/3 Hazeldine House, Central Square. Tel: 0952 506771.
Telford. Telford Electronics, 38 Mall 4. Tel: 0952 504911.

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Newcastle-under-Lyme. Computer Cabin, 24 The Parade, Silverdale. Tel: 0782 636911.
Stafford. Computerama, 59 Foregate Street. Tel: 0785 41899.
Stoke-on-Trent. Computerama, 11 Market Square Arcade, Hanley. Tel: 0782 268524.

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Ipswich. Brainwave Micros, 24 Crown Street. Tel: 047 350965.

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Bagshot. P & H Electronics, 22-24 Guildford Road. Tel: 0276 73078.
Croydon. Laskys, 77-81 North End. Tel: 01-681 8443.
Croydon. The Vision Store, 53-59 High Street. Tel: 01-686 6362.
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Epsom. The Micro Workshop, 12 Station Approach. Tel: 0372 721533.
Guildford. Walters Computers, Army & Navy, 105-111 High Street. Tel: 0483 68171.
Wallington. Surrey Micro Systems, 53 Woodcote Road. Tel: 01-647 5636.

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Woking. Harpers, 71-73 Commercial Way. Tel: 0486 225657.

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Bexhill-on-Sea. Computerware, 22 St. Leonards Road. Tel: 0424 223340.
Brighton. Boots, 129 North Street. Tel: 0273 27088.
Brighton. Gamer, 71 East Street. Tel: 0273 728681.
Brighton. Laskys, 151-152 Western Road. Tel: 0273 725625.
Crawley. Gatwick Computers, 62 The Boulevard. Tel: 0293 37842.
Crawley. Laskys, 6-8 Queensway. Tel: 0293 544622.
Eastbourne. Boots, 15 Eastbourne Arndale Centre. Tel:

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Gateshead. DP Supplies, St. Andrews House, Westfield Terrace. Tel: 0632 785068.
Newcastle-upon-Tyne. Boots, Eldon Square. Tel: 0632 329844.
Newcastle-upon-Tyne. Laskys, 6 Northumberland Street. Tel: 0632 617224.
Newcastle-upon-Tyne. RE Computing, 12 Jesmond Road. Tel: 0632 815580.

WALES

Aberdare. Inkey Computer Services, 70 Mill Street, The Square, Trecynon. Tel: 0685 881828.
Aberystwyth. Aberdata at Galloways, 23 Pier Street. Tel: 0970 615522.
Cardiff. Boots, 26 Queens Street & 105 Frederick Street. Tel: 0222 31291.
Cardiff. P & P Computers. 41 The Hayes. Tel; 0222 26666.
Swansea. Boots, 17 St. Marys Arcade, The Quadrant Shopping Centre. Tel: 0792 43461.

WARWICKSHIRE

Coventry. Coventry Micro Centre, 33 Far Gosford Street. Tel: 0203 58942.
Coventry. Impulse Computer World, 60 Hertford Street Precinct. Tel: 0203 553701.
Coventry. JBC Micro Services, 200 Earlsdon Avenue, North Earlsdon. Tel: 0203 73813.
Coventry. Laskys, Lower Precinct. Tel: 0203 27712.
Leamington Spa. IC Computers, 43 Russell Street. Tel: 0926 36244.
Leamington Spa. Leamington Hobby Centre, 121 Regent Street. Tel: 0926 29211.
Nuneaton. Micro City, 1a Queens Road. Tel: 0203 382049.
Rugby. O.E.M., 9-11 Regent Street. Tel: 0788 70522.

WEST MIDLANDS

Birmingham. Boots, City Centre House, 16-17 New Street. Tel: 021-643 7582.
Birmingham. Laskys, 19-21 Corporation Street. Tel: 021-632 6303.
Dudley. Central Computers, 35 Churchill Precinct. Tel: 0384 238169.
Stourbridge. Walters Computer Systems. 12 Hagley Road. Tel: 0384 370811.
Walsall. New Horizon, 1 Goodall Street. Tel: 0922 24821.
West Bromwich. DS Peakman, 7 Queens Square. Tel: 021-525 7910.
Wolverhampton. Laskys, 2 Wulfrum Square. Tel: 0902 714568.

YORKSHIRE

Bradford. Boots, 11 Darley Street. Tel: 0274 390891.
Leeds. Boots, 19 Albion Arcade, Bond Street Centre. Tel: 0532 33551.
Sheffield. Laskys, 58 Leopold Street. Tel: 0742 750971.
York. York Computer Centre, 7 Stonegate Arcade. Tel: 0904 641862.



PRINTERS

ALL PRINTERS HAVE A 12 MONTH GUARANTEE

DOT MATRIX

KAGA TAXAN:

* Epson Compatible Control codes * 80 or 156 Column
* NEAR LETTER QUALITY Print using 23 x 18 matrix
* Text Modes include Normal, Italic, Enlarged, Condensed, Super/Sub Script, Proportional
* Dot Addressable graphics in various modes
* 3K buffer which can also hold user defined characters
* Extra ROM/RAM socket for custom print fonts
* Friction & Tractor feed with built in paper roll holder

KP810 (80 column) £255 (a)
KP910 (156 column) £359 (a)

EPSON:

The industry standard printer offering the quality, reliability and versatility.

RX80T £215 (a) RX80FT £225 (a)
RX100 £345 (a) FX80 £315 (a) FX100 £435 (a)

DAISY WHEEL

BROTHER HR15: • 14 cps • 3K Buffer • Two colour printing • Proportional spacing * Underline * * Bold * Shadow print * Super/Sub script + many other features.

BROTHER HR15 £325(a)

JUKI 6100: • 15 cps • 2K Buffer • Switchable 10/12/15 cpi • Proportional printing • Linear Motor for max reliability.

JUKI 6100 £325(a)

ACORN VIEW PRINTER DRIVER GENERATOR

As well as coming with pre-defined drivers for printers including EPSON FX80, JUKI6100 etc, this generator enables you, by answering a few simple questions, to generate your own dedicated driver for almost any printer. The days of having to buy individual dedicated printer drivers are gone! £10(d)

EPSON HI-80 PLOTTER

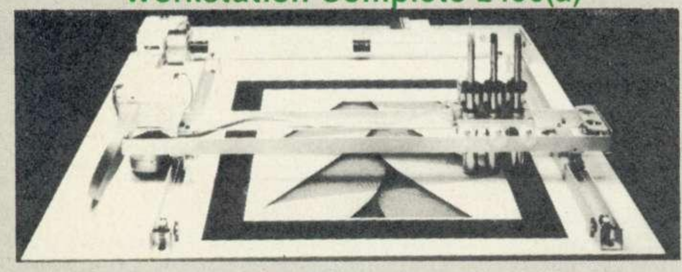
NEW

This new A4 size Epson plotter has many features and commands not present on plotters costing far more. Features include: 4 pens at same time — up to 10 colours, various types of pens, high plotting speed, can produce text in normal way as well as user defined characters, text can combine with graphics etc., £399(a)
ROMs available to make H1-80 operate with HP control codes.

GRAPHICS PLOTTER/WORK STATION

Equally at home in the artists studio, hobbyists workshop, science lab or a classroom, this system has something to offer for everyone. The 3 colour graphics plotter provides both precision and versatility. The carriage can be moved with an accuracy of 0.025cm over an A4 area — the plotter being able to accept paper and far thicker materials at sizes of up to A3. The basic plotter carries 3 colour pens each of which is software selectable. Additional accessories greatly enhance the versatility of the unit without losing the accuracy. The servo controlled drill/router, and scriber can be used on various materials. A unique Opto Sensor (using a Hewlett Packard device) turns the plotter into a high-res scanning digitiser to read & store whole diagrams and photographs. Workstation comes complete all accessories.

Workstation Complete £490(a)



Basic Plotter £270(a)

Opto Sensor £72(c) Drill/Router Attachment £79(c)
Power Supply: PS12V £42(c) PS24V £78(c)
Scandump Utility Disc £14.95 (d)

TECHNOMATIC

All prices exclude VAT

PRINTER ACCESSORIES

EPSON NEW
32K Internal Buffer Parallel £99(b)
Paper Roll Holder £17(d) FX80 Tractor Attachment £37(c).
Interfaces: 8143 RS232 £28(c); 8148 RS232 + 2K £57(c); 8132 Apple II £60(c); 8165 IEEE + Cable £65(c).
Serial & Parallel Interfaces with larger buffers available.
Ribbons: RX/FX/MX80 £5.00(d); RX/FX/MX 100 £10(d);
FX80 Dustcover £4.50(d)

KAGA TAXAN: RS 232 Interface + 2K buffer £78(c); Ribbon KP810/910 £6(d)

JUKI: RS232 Interface £65(c); Spare Daisy Wheel £14(d); Ribbon £2.50(d); Sheet Feeder £129(a) Tractor Feed Attach £129(a)

BROTHER HR15: Sheet Feeder £189(a) **Ribbons Carbon or Nylon** £4.50(a)

BBC Printer Lead: Parallel (42") £7(d); Serial £7(d)
Printer Leads can be supplied to any other length.

Plain Fanfold Paper with extra fine perforation (Clean Edge):
2000 sheets 9.5" x 11" £13(b) 2000 sheets 14.5" x 11" £18.50(b)
Labels per 1000s: Single Row 3½" x 1 7/16" £5.25(d)
Triple Row 2-7/16" x 1 7/16" £5.00(d)

PRINTER SHARER/BUFFER

A unique sharer/buffer that provides a simple solution to improve system utilisation. it can be connected to up to three computers and it will automatically switch between the computers to scan for data — no manual switching required. High speed data input rate to the buffer cuts down the normal waiting time for the computers for the printing operation to complete and thus allowing the computers to be used for other uses. In networked systems it can eliminate the printer server unit. The 64K buffer would hold over 30 A4 pages of text.

Facilities include: COPY, PAUSE AND RESET. LED indication for percentage of memory available and data source. Mains powered. Send for detailed specification.

TSB 64 Buffer/Sharer £245(a)
Cable Set £30

PERIPHERAL & COMPUTER SHARERS

We now offer an extended range of peripheral sharers to allow the user to switch between computers, printers and modems. High quality switching mechanisms housed in fully shielded metal cases ensure reliability. No power required.

Three Computers to one centronics printer (all 36 lines switched) £65(b)
Four Computers to one centronics printer (all 36 lines switched) £79(b)
Three Computers to one serial printer/modem (all 25 lines switched) £59(b)
Four Computers to one serial printer/modem £69(b)
BBC Cable Sets 3 way £22(c) 4 way £27.50(c)

Computer Sharer:
Allows one computer to be connected to two parallel printers fitted with cable for the BBC computer £19.50(b).

GRAFPAD

A low cost graphic tablet offering the performance & durability required by industrial and educational users. It is compact, accurate & reliable; working area 240 x 192mm + menu area. Comes complete with a CAD package. £110(b).

01-208 1177

Please add carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1 and VAT at 15% to order. Carriage (a) sent by Datapost

MONITORS

All monitors supplied with BBC lead

MICROVITEC

All 14" monitors now available in plastic or metal cases, please specify your requirement.

14" RGB		with PAL & Audio	
1431 Std Res	£165(a)	1431 AP Std Res	£210(a)
1451 Med Res	£240(a)	1451 AP Med Res	£280(a)
1441 Hi Res	£399(a)	These monitors can receive TV programs thru a Video Recorder	

20" RGB with PAL & Audio

2030CS Std Res	£380(a)	2040CS Hi Res	£685(a)

KAGA TAXAN 12" RGB

VISION II Hi Res £235(a) VISION III Super Hi Res £340(a)

SANYO CD3125NB 14" RGB Std Res £179(a)

MONOCHROME MONITORS:

SANYO DM8112CX Hi Res 12" Green Screen	£90(a)
KAGA KX1201G Hi Res 12" Etched Green Screen	£99(a)
KAGA KX1202A Hi Res 12" Etched Amber Screen	£105(a)
ZENITH 123 Hi Res 12" Green Screen	£68(a)
ZENITH 122 Hi Res 12" Amber Screen	£68(a)
Swivel Base for Kaga Monochrome fitted with Digital Clock	£21(c)
Monitor Plinth for the BBC	£13.50(b)
Double Tier Plinth for BBC and flat pack dual drive	£19.50(b)

BBC Leads Kaga RGB £5(d) Microvitec £3.50(d) Monochrome £3.50(d)

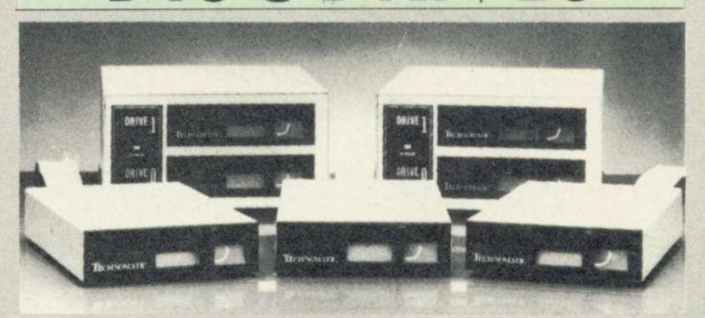
RB2 TRACKER BALL

Marconi with its years of experience making tracker balls for use in Military and Air Traffic Control have developed a quality device for the serious hobbyist, for educational uses, and for low cost CAD/CAM applications. RB2 is a compact, ergonomically designed tracker ball that provides precise positional control and rapid direction changing using a freely rotating resin ball in any direction without the limiting stops or the zero point drift of joystick controls. Three switch buttons enable easy software manipulation to incporate the use of the tracker ball. Appropriate software will enable the RB2 to take over the functions of cursor keys in word processing, CAD/CAM applications and two dimensional positional controls of robots, drillheads etc. RB2 which plugs into the user port is supplied with utility programme to use it as a joystick with other software, a comprehensive graphics/CAD program and a program demonstrating its editing capabilities. User guide includes instructions on writing your own programs for the RB2. £52(b)

AMX MOUSE – As seen on the BBC TV Micro progam

In conjunction with a controlling ROM this sophisticated mouse has many advanced features such as Icons, Windows etc., these can be used in ordinary programs as well as sophisticated CAD Design. The supplied 'AMX ART' is a superb, yet simple-to-use CAD package allowing the creation of amazing graphical designs. A screendump for drawings is included. It can also be used with Wordwise/View to replace the cursor keys. Supplied complete with CAD Package, ROM and full instruction manual. £75(b)

DISC DRIVES



TECHNOMATIC disc drives come fitted with high quality slimline Japanese mechanisms and represent the state of art in disc drive technology. They are built to highest standards and are all tested to their full performance capability before packaging. Single drives are offered with or without integral power supply whilst the dual drives are supplied with generously rated switch mode power supply. Attractively designed steel casings are painted in hard wearing BBC matching paint. All drives can operate in single and double density modes. Drives are supplied with cables, manual and formatting disc and are ready to be fitted to the computer.

Single Drives

1 × 100K 40T SS : TS55A £100(b); CS55A with psu £125(b)
1 × 200K 40/80T SS : CS55E with psu £150(b)
1 × 200K 40T DS £115(a)
1 × 400K 40/80T DS : TS55F £125(a); CS55F with psu £169(b)

Dual Drives

2 × 100K 40T SS : TD55A with psu £250(a)
2 × 400K 40/80T DS : TD55M with psu £310(a)
2 × 400K 40/80T DS : TD55MP in flat pack with built-in plinth £325(a)

DISC DRIVE MULTIPLEXER

A simple device that enables up to four computers to be connected to one single or dual drive. Ideal unit for installing in classrooms where networking is not planned or necessary or the costs have to be kept low or where software information is shared. Several of these units can be installed in series to connect more computers to access the same discs. Units supplied with 5' of cable per outlet as standard. Mains powered.

TDM 4 Quad Unit (upto 4 computers) £135(a)
TDM 2 Dual Unit (2 computers) £75(b)

Note: All computers must be fitted with a DFS

3M FLOPPY DISCS

Authorised Distributor Data Recording Products 3M

Industry standard high quality discs with guaranteed error free performance for life.

Discs in packs of 10:

40T SSDD £15(c)	40 T DSDD £18(c)
80 T SSDD £22(c)	80 T DSDD £24(c)

DISC ACCESSORIES

Single Disc Cable £6(d) Dual Disc Cable £8.50(d)
10 Disc Library Case £1.80(d) 30 Disc Case £6.00(c)
Lockable Storage Boxes 40 Discs £14(c) 100 Discs £19(c)

The FLOPPICLENE disc head cleaning kit is the ideal way to ensure the optimum performance of your drives. The use of disposable cleaning discs eliminate the risk of recontamination and abrasion of the sensitive disc heads and ensure continuously reliable data capture and transmission.

Floppiclene with 20 disposable cleaning discs. £14.50(b).

COMMUNICATIONS

MODEMS

ACORN PRESTEL: The official Acorn add-on — an advanced BT Approved. Auto-Dial, Prestel Terminal ideal for British Telecom Gold. Comprehensive software includes 'tagged' frames, downloading of Telesoftware, saving of frames, printing, sophisticated 'Mailbox' handling c/w editor. A built-in speaker allows line monitoring. A simple !BOOT file allows automatic operation **£99(b)**

BUZZ BOX A full spec, BT approved, pocket size, direct connect modem with both originate & answer modes, full & half duplex, allowing access to many databases, bulletin-boards as well as Intercomputer communications. It conforms to CCITT V21 300/300 Baud Standard. Battery/mains powered **£62(c)** BBC Lead **£6** External PSU **£9(c)**

MINOR MIRACLES WS2000 A world standard modem, having BT approval, covering V21,V23,BELL 103/113/108 and including 75,300,600,1200 Baud ratings. (It even includes 'reverse Prestel'!). This is the modem that will cover 'Prestel' type systems as well as Bulletin Boards both in the UK and abroad. What possibly gives this modem its biggest advantage is its option of computer control. A 25Way RS232 input as well as possible computer controlled auto-dial/auto-answer makes this modem unique. WS2000 **£129(c)** BBC Serial Cable **£7**



WS2000 Auto-Dial card: includes an integral loudspeaker for monitoring of the phone line **£30(d).**

BBC User Port cable (for modem control) **£7.**

SKI KIT (Allowing total control of the modem by your computer) **£10.**

DS1 Disc (for Commstar): When used with the Auto-dial card, SK1 Kit, and a user port cable, this software will dial out to Prestel, enter your password etc. and leave you in Commstar. Will also store many bulletin board telephone numbers for autodialling **£10.**

WS2000 Auto-Answer Card £30(d).

(Please note that the A/D & A/A Cards are still awaiting BABT Approval.)

UNICOM A High Performance, yet low-cost Modem. Features include: Auto-dial & auto-answer, Auto baud rate scan, 75,300,1200 Baud rates with V21, V23 and Bell standards. Sophisticated software in ROM allow many features like: Auto-Dial. Redial, Remote facilities etc. An Auto-Dial disc allows storage of commonly dialled numbers. UNICOM **£49.95(b)** Unicom ROM **£20** Unicom Disc **£9.95** Unicom Cable **£6(d)** Not BT approved

TELEMOD-2 A BT approved modem complying with CCITT V23 1200/75 Duplex & 1200/1200 Half-Duplex standard, that allows communication with Viewdata services e.g. Prestel, Micronet etc., as well as using 1200 Baud for communicating with other computer users. Mains powered. TELEMOD 2 **£65(b)** BBC Lead **£7.00**

COMMSTAR An ideal communications Rom. Extremely easy to use, yet very versatile. It features both a Prestel mode as well as a Terminal mode, thus offering very good value for money. In Prestel mode, all normal Prestel features are available including, downloading of software, saving and retrieving of pages on disc, page tag, revealing of hidden text etc. Its terminal mode is ideal for bulletin boards etc. All input may be copied into a buffer in memory over which full control is available. Controls of protocols are very simple and any type of file, (not just ASCII) may be sent using XModem protocols. Even includes an elapsed time-clock. **£29(d)**

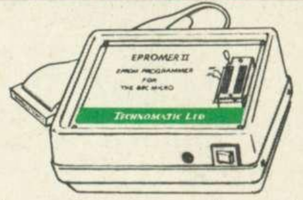
TERMI-II A good all round package for communicating with notice boards, electronic mail services etc. Termi is a semi-intelligent terminal emulator allowing the BBC to act as a dumb terminal, slave BBC graphics terminal, or VT52 terminal. The rates at which data is sent or received is easily set up with rates of up to 4800 Baud with 40/80 col. selectable. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Termi is not suitable for PRESTEL). **£28(d)**

COMMUNICATOR This is a full 80 col VT100 terminal emulation program on 16K eprom. It is a more advanced program than TERMI and features easy to follow screen menus. The rate at which data is sent or received is easily set up with rates up to 19200 Baud with 80 column text. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Communicator is not suitable for PRESTEL). **£59(d).**

TECHNOMATIC

All prices exclude VAT

EPROMER II



This enhanced eprom programmer will handle the full range of popular single rail eproms. Its sophisticated menu driven software makes the programming of eproms simple and efficient. Features included in this programmer are normally found in industrial grade programmers costing many times more.

- Interfaces with the BBC through 1 Mhz bus. Fully buffered and complies with the ACORN protocols. Integral power supply ensures no power drain from the computer.
- All eproms up to 16K programmable in single pass.
- User friendly software driven menu provides total control from the keyboard — no knobs to fiddle with.
- Selectable programming voltage — 25/21/12.5V.
- Defaults to normal programming — high speed algorithmic programming selectable.
- READ/BLANK CHECK/PROGRAM/VERIFY at any address or addresses.
- Constant display of all options selected.
- Full screen editor with HEX/ASCII input — Full TAPE/DISC filing facility.
- Data entry from the keyboard, disc/tape or another eprom.
- Several BBC BASIC programs can be entered on one eprom.

EPROMER II with manual & cassette **£99(b)** Software on: Disc **£3** ROM Based software **£12.50** extra

UV ERASERS

UVT1T Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins. **£59(b).**

UV1T as above but without the timer. **£47(b).**

For Industrial Users, we offer UV140 and UV141 erasers with handling capacity of 14 eproms. UV141 has a built in timer. Both offer full built in safety features UV140 **£61;** UV141 **£79(b).**

SMARTMOUTH

The original 'Infinite Speech' Synthesiser — Still the best around!! A ready built, self contained speech synthesiser unit, attractively packaged with built in speaker. Tailored frequency response audio stages for optimum sound quality. Any word can be easily created — very economical with memory. Plugs into the user port — no roms required. Demo and development programs supplied on cassette (easily transferred to disc) **£31(c)**

'TIME-WARP' REAL-TIME CLOCK CALENDER

We have broken the price barrier! A low cost unit, allowing the facilities of units costing far more. Built to professional standards, it opens up the total spectrum of Real-Time applications. Possibilities include desk diary/planner, calender, continuous display of on-screen time and date information, automatic document dating, precise timing and control in scientific applications — its uses are endless. Simply plugs into the user port — battery backup is supplied as standard. A full manual as well as Extensive software on cassette (easily transferred to disc) — no ROMs needed. **£29(c)**



RAMROM-15

The advanced sideways ROM/RAM expansion system. This is an external unit, using high quality construction, attractively packaged in a BBC coloured metal case, allowing easy access to all the sockets. (Allows other units to be fitted inside the BBC). Absolutely no soldering is required. Allows 11/12 additional sideways ROMs to be fitted with an option of up to 16K sideways RAM. All commonly available RAM can be used i.e. 4801/6116/6264 or xx128. All the hardware to take the RAM is already fitted e.g. battery backup. For development work and further expansion, most of the 6502 processor signals are available. Supplied with utility disc and full instruction manual. **£112(b)**

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Please add carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1 and VAT at 15% to order. Carriage (a) sent by Datapost

ATPL SIDEWISE ROM EXPANSION BOARD

This is a well constructed expansion board, that does not require soldering in its installation. All buses are buffered. It allows full sideways Rom expansion to a total of 16 ROMs. One socket has been split into two 8K sockets to allow the use of 8K byte CMOS RAM chips, giving a total of 16K sideways RAM. This is ideal for sideways rom development, and will also allow downloading of software from cassette or disc. The battery backup option will allow retention of data in the RAM, when power to the computer is removed. Several link-selectable options include the choice of type of Eprom, and a 'write-protect' for the RAM option. **£39(d)** Back-up Kit **£18**.

ACORN IEEE INTERFACE

This interface enables a BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard, at a lower price than other systems, but without sacrificing any aspect of the standard. The interface can link up to 14 separate IEEE compatible devices. Typical applications are in experimental work in academic and industrial laboratories, with the advantage of speed, accuracy and repeatability. The interface is mains powered and comes with cables, IEEEFS ROM, and user guide. **£282(a)**

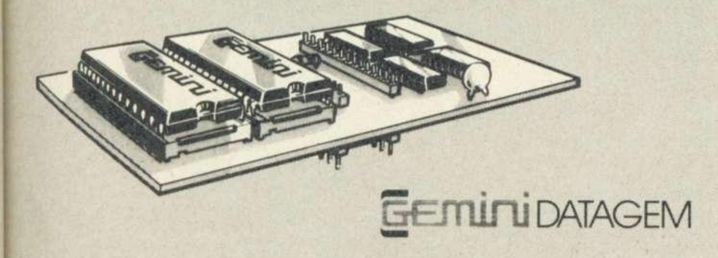
ACORN TELETEXT INTERFACE

This interface allows the retrieval and storage of data transmitted by both BBC and IBA. There are currently many educational and other programs being transmitted, and this unit will allow their retrieval absolutely free. In 'Terminal' mode, the system receives and decodes pages from both Ceefax and Oracle. (These pages can be stored). In 'Telesoftware' mode, the system can load, run and execute programs that are transmitted. This unit gives you a professional teletext terminal at a cost effective price. **£180(b)**

ACORN MUSIC 500

Convert your BBC micro into a sophisticated music composition aid and sound effects generator. Custom made software will provide you with the flexibility to compose, experiment, perform and teach music. Stereo output can be connected to a sound system including your home stereo unit. Full specification on request. **£174(a)**

DATABASE MANAGEMENT SYSTEM



The Definitive Random Access, 24K ROM Based DATABASE MANAGEMENT SYSTEM.
Datagem is the first truly flexible database for the BBC Micro that can make your system really useful and efficient, saving you money in the long run. The system includes a carrier board containing two Eproms, demonstration applications disc in both 40/80T, professional documentation with quick reference card, and 'Trans' utility program. Features include: *almost unlimited file size (max 10MByte) *supports up to 4 drives *Max of 5000 records per file *max 6K record size *max of 62 fields *9 level hierarchical search system with facilities to store results of searches. Searches can be any one of the following: Search, Include, Exclude, Combine, Common or Difference *user defined variables *generates form letters from records. Please ask for leaflet. **£112(c)**.

STARdataBASE A fast machine code, true random access database program in a 16K Eprom. Up to 4096 records in a file, up to 69 fields in a record. The record layout is totally user defined. Entirely menu driven — thus very user friendly. Extremely fast searches are possible using the Keysearch facility. Mailmerging from View and Wordwise, and address labelling. Its printer configuration suits any BBC compatible printer. **£75(d)**

ROMs/SOFTWARE

VIEW Acorn's new version V2.1 word processor rom. Advantages include printing straight from memory and editing in any mode. **£48(c)**

HI VIEW Disc based version of VIEW word processor for use with the 6502 2nd processor. Allows 47K of user memory **£52(c)**

VIEW INDEX Disc based program to create an index from VIEW text files. Ideal for anyone concerned with writing extensive reports or books. **£13(d)**

WORDWISE One of the most popular word processors for general use **£34(d)**. Wordwise SpellCheck Disc — A must for any serious word processor user. Normal price **£16.50(d)**. If bought with Wordwise: No p&p and only **£14**.

WORDWISE PLUS The new advanced Wordwise on a 16K eprom, for the more specialised users who require added features and flexibility. New facilities include: 2nd Processor compatible allowing 80 column previewing in all cases, a new Basic-like language, new editing features and embedded commands etc etc. Four new programs are also supplied allowing mail-merging, index generating, two-column text printout and continuous processing. A new 56 page introductory manual and a 180 page reference manual complete this rather special package. Finally, it is able to use existing Wordwise files without any modification. **£49(d)**.

SPELLCHECK II: A rom based fast machine code program that works with both VIEW and WORDWISE. Vocabulary disc supplied with 6000 words can be expanded to well over 17000 words on 100K drive. Fully compatible with 6502 second processor. **£26(d)**

ISO-PASCAL: Acorn's full implementation of International Standard Pascal on two 16K ROMs. Disc Version for use on 6502 2nd Processor also supplied. Comprehensive manual. **£60(c)**

ACORN LOGO A full implementation of the Logo language from Acornsoft. Supplied as two ROMs with a tutorial course and technical manual. **£60(b)**

ULTRACALC 2 This enhanced version of the original BBC Publications popular spreadsheet rom includes many new features including full compatability with the 6502 2nd processor running as HiCalc allowing 44K of user memory, operate in any mode, greater flexibility in printer control, spooling as ASCII file etc. All these features are in addition to the existing powerful features such as handling of labels and numbers as values. Column width control and features normality found in well designed spreadsheets. **£69(d)**

VIEWSHEET Acorn's spreadsheet provides 255 columns and 255 rows and will operate in any mode. Windows can be created which can then be rearranged to provide any print format required. Function keys provide for easy entry of commands. Printer control codes can be used using the printer driver. Fully compatible with VIEW and the 6502 2nd Processor. **£52(d)**

BCPL A full implementation of the BCPL compiler language consisting of the language rom, disc containing the BCPL compiler, a screen editor, a 6502 assembler, other utilities and programming aids and examples of BCPL code and a 450 page manual. BCPL can be used to develop games, programs, commercial packages, system software, to write control systems and to produce programs which otherwise would need to be written in assembler. **£52(b)**

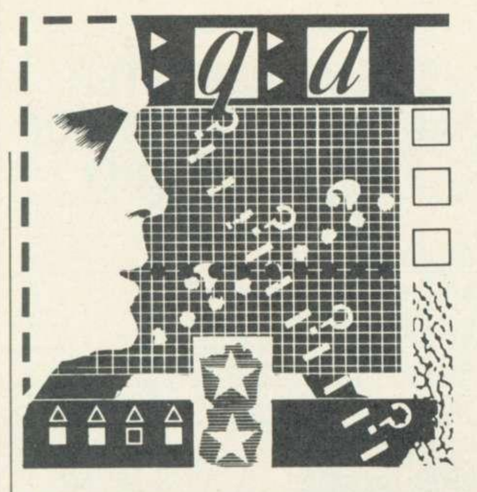
BCPL STAND ALONE GENERATOR Utilities in this package enable the programs developed using the BCPL rom to be converted so that they can be run on any BBC micro whether it has a BCPL rom or not. Stand alone programs for other 6502 based systems can also be developed. **£43(d)**

BCPL CALCULATIONS PACKAGE: supplied on disc, it supports floating point, fixed point and fast integer calculations. It includes the BCPL calculation files, example files and a comprehensive user guide. **£17.30(b)**

ACORN LISP Rom **£43(d)**

G:FORTH An advanced implementation of FORTH which follows the 79-Standard specification on a 16K ROM and has a full double number extension set. It incorporates an editor, 6502 assembler, very fast turtle graphics and supports extensive string and file handling. It contains 540 predefined words including those for reading joystick ports, produce sounds, set and read the time and produce random numbers. Fully compatible with disc or tape filing systems and works in any mode. Package comes complete with a USER GUIDE, Introduction to FORTH and 16K GFORTH ROM **£43(d)**

DISC DOCTOR Computer Concept's popular disc utility rom which adds 20 commands to the DFS system. **£27(d)**



Martin Phillips' topics this month include unlistable listings, impossible line numbers and an IQ test guaranteed to 'crash' your micro

Make April fools of your friends with our Idiotmeter

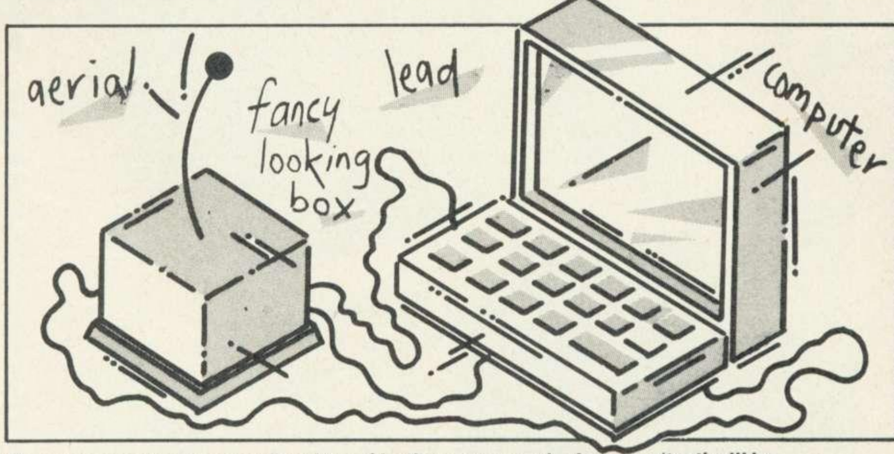
MOST PEOPLE hold the computer in considerable awe and assume it is blessed with powers way beyond its actual capabilities. This image can be exploited to produce a novel practical joke, ideal for April.

You can make a device called an Interactive Determination of Intellectual Objectivity Test Meter (think about it), which is a combination of hardware and software. The software is presented in the yellow pages (p.99). The hardware, well, that's left to your own imagination, but the more switches, dials, lights and impressive cables that are associated with the meter, the more it will impress and convince (no actual connection needs to be made to the computer for this meter – it only needs to look connected).

One essential item is an aerial – this can be a coat hanger bent into an unusual shape. There needs to be a sealed box for the meter, and a lead to 'connect' it to the computer – you could use a printer cable.

For Electron owners, how about using a spare cassette lead? I tried the meter out on a few people using the Teletext adaptor with a label over the legend, and for an aerial I used a portable TV aerial plugged into the back. Similarly, a second processor box could be used.

The idea is that an unsuspecting person (obviously not a reader of *Acorn User*!) sits in front of the meter and it will read his or her IQ directly. The victim is first presented with a screen display outlining the plausible(?) method of operation of the meter – it is



The more impressive your 'hardware' is, the more convincing your 'test' will be

supposed to be able to pick up electromagnetic radiation coming from the brain (which is why you need an aerial). The computer then presents the victim with a series of simple problems which he or she has to answer aloud. As it measures and displays the IQ rating, it tailors the speed at which the problems are displayed, and is therefore able (so the 'theory' goes) to push the person's mental work rate to its maximum, thereby determining the IQ.

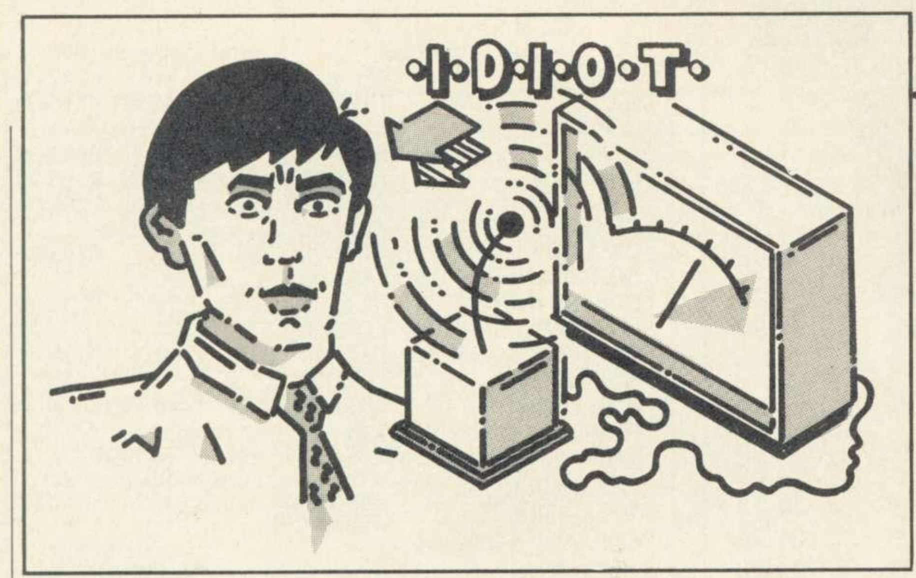
It's surprising how many people will believe such a tale! The hard part is keeping a straight face, and that is why the information has been presented on the screen.

The program first displays the theory of operation and instructions for use. Then it will show an analogue meter with a red pointer. The meter scale is graduated and labelled 0–200: this is the IQ rating. The meter does not, of course, do any actual reading but simply starts the IQ rating off at about 50. Then 30 simple tables problems are asked and the pointer will move in an irregular fashion until the IQ rating is somewhere about 140. The speed at which the problems are displayed increases as the IQ rating rises, and reaches such a pitch that many people start getting flustered and are unable to keep up. Then another 20 or so problems are presented very quickly and the meter reading starts to drop and eventually falls off the screen below 0. At this point the computer does a simulated 'crash'. The screen display starts to flash and then goes blank. A low continuous note is sounded, and on the BBC micro the three keyboard lights come on simultaneously. Pressing any key on the keyboard has no effect. Escape does not work, and Break makes the screen flash but does nothing else. In fact the only ways to stop the computer are to switch it off or to press CTRL-Break. By this time the victim thinks that he or she has damaged the computer.

The first procedure in the program is PROCinitialise. This sets up the actual screen colours required, switches off the cursor, initialises some variables, turns off the keyboard auto-repeat and programs function key 10 (the Break key) to return to the middle of the procedure PROCcrash. This is not good programming, but it works and, anyway, the aim is to get the program to crash. The line number specified in this definition will not be altered should the program be renumbered, so if any changes are made to improve the program then this line number will probably need changing too.

The program works by first printing the instructions on the screen (PROCinstructions). It is in mode 1 and there is a double height print routine for the

IF YOU have a technical hitch or a programming problem let Martin Phillips give his diagnosis. We'll pay £5 if you raise a really interesting point. Please give full details of the system you're using and include a listing where appropriate, making your question as specific as possible. WRITE TO: Hints & Tips, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.



The meter reading will drop after a while. . .until the IQ rating falls below zero!

title. This is displayed in red on a white background, and the text is in blue – while it is actually being printed on the screen it's in white. The procedure waits until the space bar has been pressed, and then the screen clears and the meter scale is drawn and labelled in PROCscale.

PROCbezel draws the bezel on the meter. This is the solid part at the bottom of an analogue meter that hides the meter mechanism. In this case it can be used to display the problems, which are printed in double height, and the whole bezel area is cleared for speed.

PROCpointer draws a red pointer on the screen. The parameter 'val' determines the position of the pointer and is calculated in terms of the scale, for example, val = 0 will put the pointer at 0, and val = 200 will set the pointer to the 200 mark on the scale.

PROCrun consists of two loops, one after the other. The first increases the speed at which the problems are set, and makes the IQ reading rise. A random element is included for more realism. Then the second loop prints out more sums, this time with a small random delay, while the pointer drops down to a figure well below 0, and almost disappears off the side of the screen.

PROCcrash provides the special effects to simulate the computer breaking. First the four screen colours are programmed to alter in a random fashion, then they are all changed to black. The Escape key is programmed to have no effect. Lastly, for the BBC micro owners, the cassette motor light is programmed to come on, as are the shift lock and caps lock lights. An easy way to switch the cassette motor light on is to use *MOTOR 1, which works even on a disc machine without needing to select the tape filing system. To ensure that both caps lock and shift lock lights are on, the computer is put into page mode (the text and graphics cursors must first be separated), and then the screen is made to attempt to scroll. This achieves two purposes. First, the shift and control lights will be lit, and then the program will halt until the screen can scroll. To prevent a press of the Shift key clearing the screen, this last part is put into an infinite loop.

Stop my micro hanging up

MY COMPUTER hangs up when I use VDU21 and VDU6 to stop and restart the screen display, writes Philip Newth from County Durham. The following listing shows the problem:

```
10 FOR N = 1 TO 100
20 VDU 21
30 PRINT "HELLO"
40 VDU 6
50 PRINT N
60 NEXT N
```

The program is quite pointless, but illustrates a problem which is often quite obscure and difficult to trace. When VDU21 is executed, a Return character is sent to the printer, whether it is enabled or not. If no printer is connected or if it is switched off, then the print buffer will fill up and cause the computer to hang up. Those readers who try this program with a printer connected and switched on will find that it does not hang up but that the printer starts churning out blank paper.

There are two cures. First, don't use VDU21/VDU6, use *FX3 instead (see an earlier Hints and Tips). The second is to use the 'printer sink'. This is entered using *FX5,0 and the computer then will not hang up or waste paper. When a printer does need to be used, type *FX5,1 for a parallel printer or *FX5,2 for a serial printer.

Listing the unlistable

OVER THE last few months I have received many requests for a routine to stop programs being listed. The idea for the technique I am going to present here isn't new – I first saw it in a magazine for the Acorn Atom, and it was quite easy to implement on that machine. It's not so simple on the BBC micro and Electron but it can be done.

It involves putting control codes to switch off the printer and screen display at the start of the program in such a way that they are not implemented if the program runs, but are when the program is listed. The ASCII code to switch the screen off is 21, and this can be tested by typing CTRL-W (the 21st letter of the alphabet), and then trying to enter something else. The computer is still active but no screen display will be shown – it can be turned on again by typing CTRL-F. Switch off the printer using ASCII code 3 (CTRL-C).

The REM statement can be used to obtain an unlistable listing, as anything following it on the same line is ignored when the program is run, but is printed out when the program is listed. The problem is to put the codes in after the REM statement, as this can only be done by poking the codes directly into the line. It sounds complicated, but is quite easy once the method is understood.

Before using the technique, try it out on the test program given below:

```
10 REM> > > >
20 PRINT"What a load of rubbish"
```

Line 10 is the important line. After the REM statement, there are four greater-than signs. When the program is listed, just one of these will be seen, followed by the cursor, making it appear that the computer is waiting for another command. The screen is first cleared so that the line number of the REM statement is not seen, because that would give the game away, as you'll see later.

Next, program a function key as follows:

```
        *KEY0 FOR N=PAG
E TO (PAGE+16):peek=?
N:P."&";~N,"&";~peek;
:IF peek>32 AND peek<
91 THEN PRINT"..."CHR
$(peek):NEXT:ELSE PRI
NT:NEXT |M
```

This program will list the first 16 memory locations where the program is stored. The position where it is stored in memory is given by PAGE,

which is set to &E00 on a basic Electron and BBC micro, but will change if a disc filing system, a teletext filing system, an Econet filing system, or a second processor is fitted to the machine. The '&' sign indicates that the number is printed in hexadecimal. It will not matter what value PAGE has when a modified listing is actually used. It is only important now because we need to know where the ASCII codes must be poked.

Once the function key has been programmed, the following should appear on the screen when it is pressed:

```
&1900  &D
&1901  &0
&1902  &A
&1903  &A
&1904  &20
&1905  &F4
&1906  &3E...>
&1907  &3E...>
&1908  &3E...>
&1909  &3E...>
&190A  &D
&190B  &0
&190C  &14
&190D  &1E
&190E  &20
&190F  &F1
&1910  &22
```

This listing was taken from a machine with a disc interface fitted, and so PAGE is set to &1900. Notice that nowhere in this short memory dump do the letters REM appear. BBC Basic 'tokenises' all the Basic statements to save memory space. These tokens are simply numbers that the computer is able to recognise and convert back to a statement name when the program is listed, and they are listed at the back of the User Guide. The token for REM is &F4, which can be seen at location &1905. The first '>' sign appears after the REM token, as would be expected, at location &1906. Therefore, this location needs to be changed to the control character that clears the screen, and this character has the ASCII code 12. We need to type:

```
?&1906=12
```

which will put (poke) the memory location &1906 with the value of 12. If your position of PAGE is different from the above example it will be necessary to poke the corresponding location, and not the one given, eg, on a standard Electron or BBC micro this will be location &E06. Now one '>' must be left in the REM statement, therefore locations &1908 and &1909 (&E08 and &E09) need the printer off and screen off codes inserting:

```
?&1908=3
?&1909=21
```

When these two commands are typed in, the codes will be poked into the required memory locations. Now using the function key again to display the memory contents will show:

```
&1900  &D
&1901  &0
&1902  &A
&1903  &A
&1904  &20
&1905  &F4
&1906  &C
&1907  &3E...>
&1908  &3
&1909  &15
&190A  &D
&190B  &0
&190C  &14
&190D  &1E
&190E  &20
&190F  &F1
&1910  &22
```

These ASCII codes are printed in hexadecimal, therefore the code 12 appears as &C, and 21 appears as &15. The short program in the function key puts in the '&' sign. When the program is run it will operate as expected, but try listing it and the screen will clear with just the prompt and the cursor displayed.

This can be included at the start of any program. Insert a new line, line 0. This is a good one to choose because few people realise that it can be used, and fewer still actually use it. Therefore one is not likely to overwrite part of the program itself, although it is always advisable to check first. The three memory locations also need to be changed as described above, but it is not necessary to program the function key and list the memory locations.

In order to list the program you must delete line 0, but remember anyone else could delete that line too and see the listing. The answer is to change it from line 0 to any line number up to 255, so long as it is the first line of the program, to make it harder to find.

Several lines could be included so that deleting one would have no effect. To do this, put one REM line in and then renumber the program to start at an unusual number such as 237, and then put in a new line 0. Renumber again to move this line up, and include another REM line.

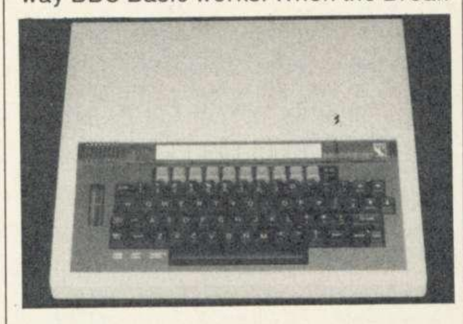
If you come across a program that has been made unlistable in this way, or you've forgotten which line in your own was programmed, define the function key as above and use that to show which line number the program starts at. Or you can list the program with the printer on – it will print just the first line number together with REM.

This all goes to show that if you take enough trouble it's always possible to discover the contents of a listing.

Don't press the Break key

B GABEL from Sussex has written in about a 'bug' he has found in BBC Basic – if you start a listing with a line number higher than 255, press Break and type OLD, then the line number becomes less than 256. The line number is in fact MODed with 256, ie, line 1000 becomes line 232. This bug makes the building up of procedure libraries difficult, he claims.

This is not a bug as such, but just the way BBC Basic works. When the Break



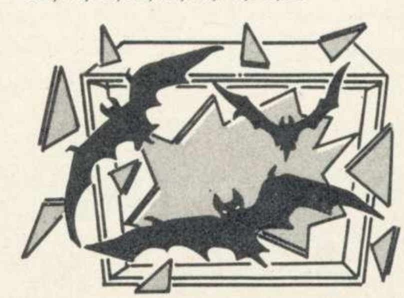
key is pressed, it puts an end of program marker (&FF) in the second location after PAGE, where the most significant part of the line number is stored.

The first location will contain the value 13 if a program was resident before Break was pressed (changing this to 0 will give a Bad program message if it is then recovered using OLD – see the tip on unlistable listings for this technique). The second location is changed to 0 by the OLD command, therefore reducing the most significant part of the line number to 0. This 'bug' should not cause any problems, and my advice to Mr Gabel is not to be so keen to press the Break key when he is writing procedures for a library.

Amazing effect

THE FOLLOWING line has the most amazing and unpredictable effect on the computer:

```
VDU12,31,12,13,66,73,71,32,65,80,
82,73,76,32,70,79,79,76,30
```



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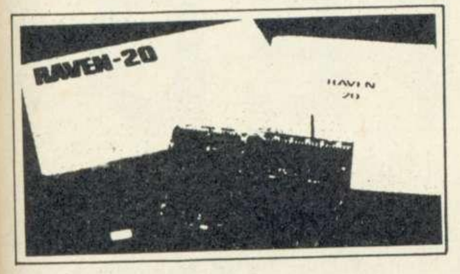
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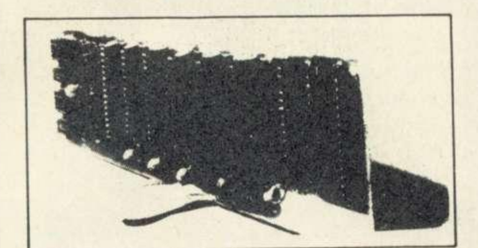
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Tessie Revivis shows you how to add character strings together, extract bits from them and juggle them about

LAST MONTH we saw how the data can be validated by a program when it is input directly from the keyboard for use in games or, more seriously, in a database. This month we'll continue that line of thought and look at some of the commands provided in BBC Basic that allow a character string to be manipulated once it has been read into the computer.

One of the most surprising aspects of string handling is that it is possible to add two strings together to form one – in fact, in an almost identical fashion to adding a couple of numbers together! If you saw the following program you probably wouldn't give it a second thought:

```
10 A%=5:B%=6
20 C%=A%+B%
```

C% would contain the sum of the contents of A% and B%. In the same way, two strings can be added together to give a result – just one long string.

```
10 A$="Hi":B$=" There"
20 C$=A$+B$
```

Running this and typing:

```
PRINT C$
```

will display the string:

```
Hi There
```

onto the screen. A$ and B$ still hold their initial character strings.

In the first program, line 20 could also be written:

```
20 C%=B%+A%
```

without affecting the end result; either way C% will contain 11. It is here that the real difference occurs. If we change line 20 of the second program to:

```
20 C$=B$+A$
```

then C$ will now contain the string:

```
ThereHi
```

Obviously you need to bear this in mind when trying to form a single string from two, three, four or more strings. Note also that in the second program I deliberately included a space before the definition of B$. As there is not a space before "Hi", the final string addition lacks the deliminator. The INPUT statement will always strip, or remove, any leading spaces you type in prior to the actual string itself. However, in addition to adding strings together, we can also insert our own bits and pieces. For example:

```
10 A$="Acorn":B$="Rools"
20 C$=A$+B$
30 PRINT C$
```

would print:

```
AcornRools
```

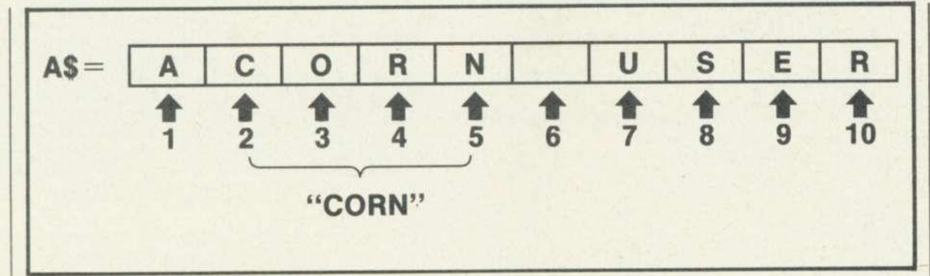


Figure 1. How MID$ works

when run. We can adjust line 20 to insert a space as required, thus:

```
20 C$=A$+" "+B$
```

Here the space between the quotes has been placed into C$; after A$ but before B$. Any text can be inserted in this manner. Try:

```
20 C$=A$+" User "+B$
```

or even control codes:

```
20 C$=A$+" "+CHR$(7)+B$
```

The CHR$(7) is the control code to produce a bleep on the Electron or Beeb's speaker. Now when you print C$ you'll get a bleep into the bargain!

There are three special commands that allow us to extract bits of strings, either from the left, the middle or the right side of the string itself – and just to remind you, they're aptly named LEFT$, MID$ and, yes, you've guessed it, RIGHT$.

Okay, try this program to see the ease with which the first of these commands can be used.

```
10 REM Demo of LEFT$
20 A$="Acorn User"
30 FOR loop=1 TO 10
40 PRINT LEFT$ (A$,loop)
50 NEXT loop
```

Rather than explain what it does, run it and see if you can fathom out what happens. The screen should show:

```
A
Ac
Aco
Acor
Acorn
Acorn
Acorn U
Acorn Us
Acorn Use
Acorn User
```

I'll explain what's happening anyhow. The LEFT$ command looks at the left side of a specified string – A$ in this instance. The second parameter which this command needs specifies how many characters from the left side of the string it should actually look at. So the command:

```
PRINT LEFT$ (A$,5)
```

would print the first five characters, including spaces and control codes, onto the screen – Acorn in the example.

The program we used sets up a loop that increments from one to 10, or if you prefer, the first to last character in that particular instance.

Forming a FOR...NEXT loop is fine, but we do not always know just how long a string is going to be, particularly if it's being INPUT from the keyboard. Luckily, BBC Basic includes a function to find the length of a specified string – LEN – and we can use it as a control parameter in our loop, thus:

```
10 REM Demo of LEN
20 INPUT "Enter your name" name$
30 FOR loop=1 TO LEN (name$)
40 PRINT LEFT$ (name$,loop)
50 NEXT loop
```

What line 30 means is that the loop will continue for as many times as the



number of characters in the string called name$. Test the program for yourself – it works!

MID$ works on the centre of strings and requires you to provide three items of information. That is, the name of the string, the start character and the end character. Thus:

```
10 A$="Acorn User"
20 PRINT MID$ (A$,2,5)
```

would print

```
corn
```

Figure 1 might make this a bit clearer. C is the second letter while N is the fifth letter. MID$ extracts these letters and all those in between. Line 20 prints the result, and it is possible to store such a result within a string variable. Line 20 might then become:

```
20 middle$=MID$ (A$,2,5)
```

This sort of technique can be useful. One application you might like to try is to produce a program that reads coded messages input into it by extracting parts of the INPUT strings. The program could also print coded messages by adding bits onto the end of each word to be printed.

The final of the three string manipulators is RIGHT$. This works like LEFT$ except that its starting point is the right-hand end of the string, as the following program shows:

```
10 REM Demo of RIGHT$
20 A$="ABUSER"
30 FOR loop=1 TO LEN (A$)
40 PRINT RIGHT$ (A$,loop)
50 NEXT loop
```

Running this program results in an output as follows:

```
R
ER
SER
USER
BUSER
ABUSER
```

Another versatile aspect of strings is that they can be used to input a string of characters that require evaluation. How would you go about writing a program that allows you to perform any type of calculation, in just two lines?

Well, Basic provides a command that will evaluate a string. Here are the two lines you need:

```
10 INPUT "Calculation is ",A$
20 PRINT EVAL (A$)
```

Run the program and enter:

```
5+3
```

after the prompt. The result printed is 8. Try some more complex inputs, including any of the micro mathematical functions – the answer is always given!

I started by saying that the INPUT command does not accept leading spaces, which is true. But there is a command, undocumented in the User Guide, that will accept everything you type in without altering it in any way, including leading spaces. The command is INPUTLINE. This is used in exactly the same way as INPUT, thus:

```
10 INPUTLINE "Enter some spaces and text"A$
20 PRINT A$
```

As always, try it and see for yourself. There are a couple more string associated commands – VAL, STR$ and STRINGS$ – all of which are documented in the User Guide. Look them up and try to improve on the examples I've given you and those provided in the manual itself – I'm sure you can!



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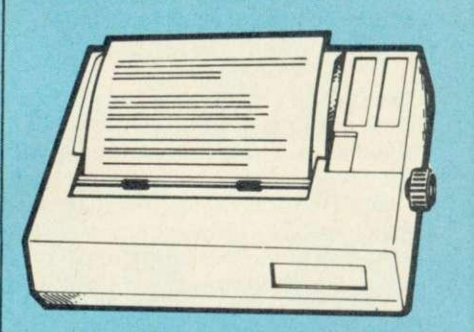
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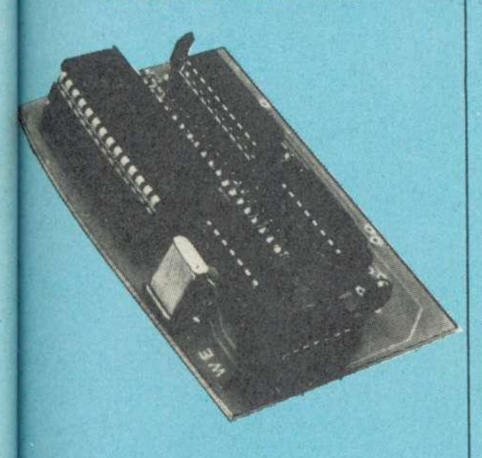
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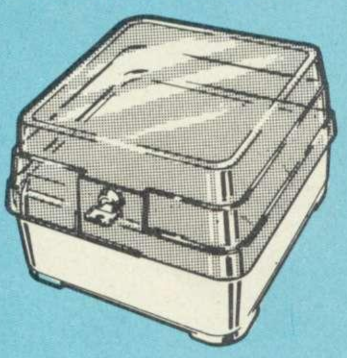
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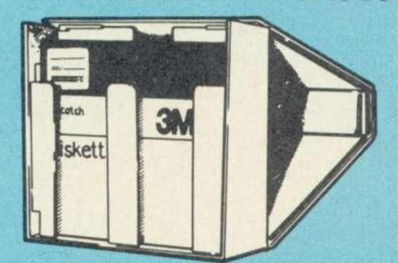
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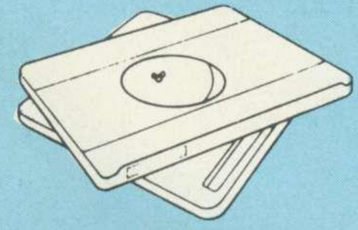
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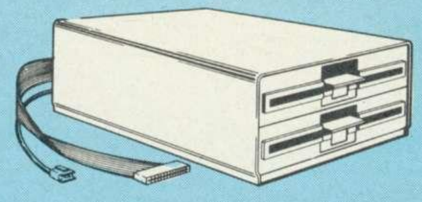
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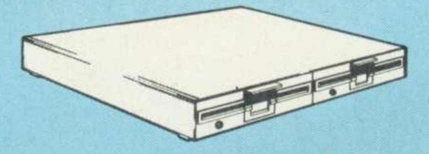
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Cont.

● MITSUBISHI & EPSON Slimline 400K Disc Drives that we supply are Double sided Double Density, 1 Megabyte unformatted, (With BBC Micro 400K after formatting). When used in conjunction with our Double Density Interface, you obtain 725K formatted. Track density is 96 TPI, track to track access time is 3mSec. These drives are very fast, quiet and efficient. We strongly recommend them.

● Extensive test carried out in our workshop has proved that the BBC Micro's own switchmode power supply is capable of driving 2 disc drives and a host of Sideways ROMs without undue heating. We recommend our CLS & CLD range of Disc Drives which will save you considerable expense without sacrificing performance.

● Please send an SAE, for further technical specification on our Disc Drives.

DUST COVERS

(For our Disc Drives)
Single (without PSU) **£3.20**
Twin (without PSU) **£3.85**
Single (with PSU) **£3.25**
Twin (with PSU) **£3.90**
Twin (side by side with PSU) **£3.95**

FORTH ROM for BBC

This ROM provides a complete implementation of the FIG-FORTH standard (including editor). Supplied with a large tutorial manual at only **£32**

TINY PASCAL for BBC Micro **£54**

NEW LAUNCH

ROM-SPELL



A ROM based fast spelling checker essential to serious word processing users of the BBC micro.

Compatible with the popular word processors VIEW, WORDWISE and also with *SPOOLED text files. Allows misspelt words to be changed without returning to the word processor. Simply load the text and execute the spelling checker, correcting the words as you go along, or all at once at the end.

An optimised word compacting technique gives a comprehensive 30,000 word dictionary as standard as well as a user defined dictionary for specialist applications. Efficient data storage also means faster operation, text can be checked at 160 words per minute!!! Equivalent to looking a word up in a standard dictionary in well under half a second!

An ambiguous word checking facility allows partially spelt words to be checked against the dictionary and all the matches displayed. This is ideal when you are uncertain of a spelling and a boon for crossword addicts!

Full access to the dictionary from BASIC allows users to check words from within their own programs. Useful for educational programing and also to compilers of word puzzles and anagram solvers.
Save time spent looking in dictionaries, use ROMSPELL.

ROMSPELL is supplied on a ROM with the dictionary disc and full instructions for Only:

£25

(Please specify 40 or 80 tracks when ordering)

THE EPSON FX/KAGA PRINTER COMMANDS REVEALED

for the BBC Microcomputer
(The only Printer Book for the Epson FX-80 compatible printers).

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

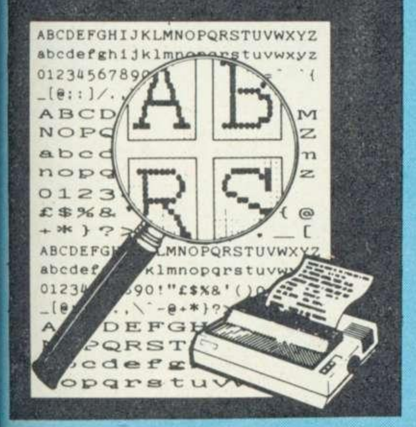
Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX/KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English how to use your printer (Kaga KP810, Canon PW1080A, or any other Epson FX-80 compatible printer) with the BBC micro, both from Basic and your Wordwise wordprocessor.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

This book is superb value at only **£5.95** (Book – No VAT)

EPSON FX/RX NEAR LETTER QUALITY PRINT ROM



Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

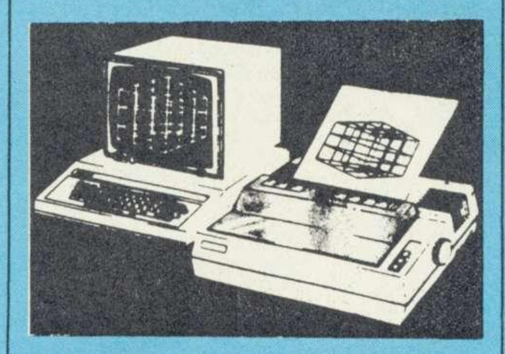
Look at the features:
- Simply type *NLQ80/100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
- Full UK character set.

Standard 'pica size'
Proportional spacing
Enlarged
Underlined
Normal type

The NLQ ROM is incredibly easy to fit and use. Supplied complete with Manual.

Only: £20

DUMPOUT 3
NOW WITH EXTRA FEATURES!



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!

The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.

Two commands are used to operate the dump routines:
*GIMAGE – This provides a full graphics dump of any Mode (including Mode 8). There are many optional parameters but you need only specify the parameters you wish to change.

- V <scale>, H <scale> – These 2 byte numbers give fine control over the size of the dump from minute to enormous. Unlike other dump ROMs, scale works the same in all modes inc. mode 7.
- R <0-3> – Print dump rotated by 0, 90, 180, 270 degrees.
- I <indent> – Set gap from left edge of paper.
- X <min><max>, Y <min><max> – Selects screen area, by default the whole graphics window is dumped.
- P – Dump shows physical colour values.
- G – Grey scale reproduction, dumps otherwise use a negative scale (white prints darkest).
- T Two tone dump for maximum resolution.
- M <mask> – 8 bit colour mask.
- E – Contrast expansion to make mode 7 text and separated graphics stand out clearly from the background.
- C – All mode 7 graphics are printed as contiguous to improve the shading in graphic areas.
- K – Key-triggered dump. The dump does not commence immediately, but can be triggered off later by pressing <SHIFT><0> or <CTRL><ESCAPE>.
- S – Switch-triggered dump. As K, but the trigger is an external switch (not supplied) connected to the user port. The S option can still work with games that corrupt RAM page D.

*TIMAGE <indent> – Does a fast, text only, dump of the contents of the text window in any mode.

*GWINDOW and *TWINDOW – These commands draw the graphics and text windows, respectively, on the screen and allow them to be changed with the cursor keys. Note that GIMAGE and GWINDOW work fully in mode 7. Designed for use with the following printers: CP80, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, LPVII, NEC PC8023, DMP100/120/200/400, etc. etc.
Price including comprehensive manual

£22

VIEW

VIEW WORDPROCESSOR
We are supplying the new VIEW version 2.1 allowing printing of memory contents etc **£46**

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£49

VIEWSHEET (Acornsoft) **£49**

Watford's own Sophisticated VIEW PRINTER DRIVER for Epson FX80 & KAGA KP

To simplify using the full facilities of the Epson FX80 or Kaga KP810 use this printer driver. Full facilities are provided for selecting between fonts etc. The disc includes examples of use and instructions. Available on 40 or 80 track disc (please state which required). **£7**

VIEW DRIVERS FOR JUKI & BROTHER PRINTERS

Only £7

VIEW/VIEW SHEET PRINTER DRIVER for SILVER REED
(Officially approved by Silver Reed)

A range of VIEW Printer drivers to complement the Silver Reed range of printers EXP400/500/550 & 770 EB 50 and converted typewriters EX43/44 & 55.

Only: £7

BEEB PRINTER ROM


"Makes Printing Childs Play"

This utility ROM is designed to simplify using all the facilities of your printer. It has many facilities:

★ Selection of printer modes such as underline, font and size is by 'Single Key' operations.

★ From Wordwise, a single number following OC will select a mode rather than a long and incomprehensible string of control codes. This makes using your printer with Wordwise much more convenient.

★ When using Basic (or other languages) you can have control over the formatting of the output to the printer in the style of a wordprocessor. You can define page top, bottom and side margins etc. with intelligent page skip for binders an option. All supported printers will now respond to form-feed etc. commands.

★ User defined characters are printed as you see them on the screen so that non-standard characters are automatically printed out correctly.

★ Commands select the options for the following printers:
GP100, STAR, NEC, MX/FX, KAGA, LP/VII/DMP100, DMP200.
Operates with either parallel or serial interfaces.

★ Supplied with a 50 page manual that is very comprehensive and easy to follow. Please specify printer type when ordering so that we can send the correct function key strip.

Price: £24

Continued ▶

TWO DATABASE MANAGEMENT SYSTEMS



DISCDATA

Discdata is an entirely disc based database handling system. It is extremely easy to use through its comprehensive menu system. The simplicity is such that we do not feel the need to provide explanation on use in the written guidance supplied with the program. The first-time database user will rapidly become familiar with this package designed throughout to be simple and obvious.
Despite the ease of use this system provides all the facilities needed for complex data handling problems. The length of database that can be handled is only limited by the total space on the disc. You can have up to 20 fields with page length records up to 254 bytes in length. Adding and deleting records, amend titles, field names and records. Sort on any field and search for any record or group of records in any field. The database may be re-formatted after creation, the system will re-write all your files for you automatically. You may add extra fields and extend the length of existing fields freely.
Output formatting is very powerful. You are allowed 40, 80 or 132 column output modes going to printer or screen. Selected fields can be put in any order on the screen or printer, either across the paper or down. Output can start or stop anywhere in the file. Decimal fields are automatically totalled and records output are counted. Version 2, now on sale has improved input and amendments procedures giving full record edit as well as the 3 extra features . . . String searching, Calculations on numeric fields, and the ability to create sub files from your main files.

On disc at **Only £17**

(Please specify 40 or 80 track when ordering)

FILE-PLUS

The File-Plus package is even more powerful and flexible than Disc-Data. It is also largely menu driven but has its own command language for file searching. The 16K ROM contains all the normally required routines, with lesser used options supplied on the utilities disc. All input and output formatting is controlled through screen forms. A full screen editing system is used to define a form which allows tremendous flexibility in the format in which your data is displayed. It is very easy to change from form to form so that you can type in your data with one form, and examine it with others. You will typically design several forms before starting to access the database so that you can quickly and easily see the fields of each record that you want to appear in the layout you decide on. The form system is also used for output to your printer.
File Plus has a unique file linking system that allows the entire on-line storage of your system to be used for one database. This can give around 1.5 Megabyte databases using dual drives and double density.
The built in FQL (File-Plus Query Language) can be used for searching the database. Presented in the form of a powerful command language with looping facilities etc. this allows the most flexible access to your data possible. Full arithmetic operations are provided to allow the system to be used for statistical analysis.

Cont.

Operations supported are –, +, *, /, +–999999 9999.9999 and compare facilities =, >,<>>=, >=, <, &,.
Many keywords are supported by the language: assign, compare, display, and, goto, iff, ift, print, read, search, spool and update.
Supplied with a very detailed 70 page manual to explain all the facilities with many examples.

Only £43

(Please specify 40 or 80 tracks for the utilities disc)

DATAGEM

Gemini's 24K ROM based DATABASE Management System

Special Offer: **£110**

PEN PAL—VERSATILE LIGHT PEN SOFTWARE

Do you have a light pen that never gets used? Then this piece of software is for you. This package offers many useful facilities that make the light pen a useful device to own. Facilities included are:

- Pixel, Line and Character definition
- Free hand drawing
- All Colours
- Fill, Refill and stripes
- User defined "Brush strokes" plus character definer
- Grid, Scale and perspective aids 2 to 200 points palletable in one design with Circles and "rubber banding"
- Move design/character to any screen position
- Save and Load screens, User defined characters and line drawings for video titles, own programmes etc.

This program has many uses in education and at home. It is supplied with a comprehensive instruction manual.
Works with Watford, RH, Acorn User, DIY and many other Light Pens.
Prices TAPE .... **£11;** .... DISC **£12**

LIGHT PEN



This Light Pen for the BBC micro is packaged in a neat pen shape with built in switch. Supplied complete with our sophisticated Pen-Pal software on cassette (see elsewhere in this ad).

Only **£20**

(For software on disc please add £2)

DISC EXECUTOR

Disc Executor is a sophisticated disc utility for the transfer of your cassette programs to disc. If you have difficulties transferring your cassette software to your disc system then this is the answer. It handles 'locked' files and full length adventures (up to &&e blocks) and programs that load below &E00. It is very simple to operate with instructions supplied. It saves you time and money. (Compatible with Single density Disc Interfaces only.)

Price **£10**

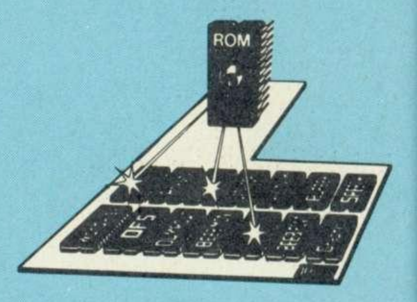
(Please specify 40 or 80 track discs)

ADE

'Systems' complete program development package in a 16K ROM. Full assembling and debugging facilities provided.

SPECIAL OFFER ONLY **£43**

ROM MANAGER

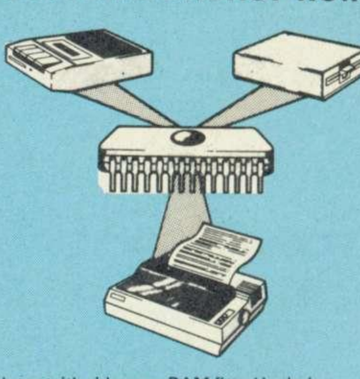


'Provides comprehensive management of all your installed ROMs – BEEBUG Nov. '84'.
This ROM is unique in its capabilities. It allows you, the user, full control over the BBC Micro's sideways ROM paging system with simple to use commands. This ROM is essential for those with several ROMs. At a simple level ROM MANAGER can be used to remove the problem of clashing command names and allow full use of all the facilities of your ROMs. This is coupled with facilities to completely enable or disable various ROMs in the machine including ROM manager itself.
ROM MANAGER can also be used to develop sideways ROMs using the machine's standard memory. This is achieved by sending sideways ROM calls to your code in RAM, saving the expense of fitting sideways RAM for ROM development purposes. ROM status reports are also given by the ROM, including ROM lengths, checksums, entry points supported and current filing system title.
The ROM also provides facilities to examine ROMs, list function keys for editing, modify RAM (using a HEX/ASCII editor) and list ROM titles neatly and concisely.

All selection between particular ROMs is by the name of the ROM and this may be abbreviated for convenience. ROM numbers can also be used if required. This ROM is very simple and obvious to use. All the facilities are explained in the clear and detailed manual.

Price **£22**

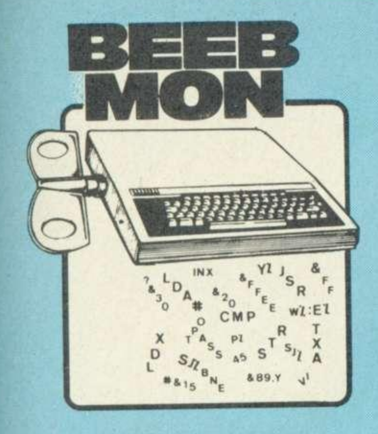
BUFFER & BACKUP ROM



For those with sideways RAM fitted in their machines this utility ROM will make full use of this facility. By using the sideways RAM area for extra memory the following features are implemented:

★ 4K or 16K buffer for parallel printer.
★ Dumps selection of Disc files to Tape.
★ Makes backup copies of tapes on to tape and disc.
★ Displays contents of paged ROMs on screen.
★ Menu display of ROM filing system contents on Shift-Break.
★ Comprehensive manual.

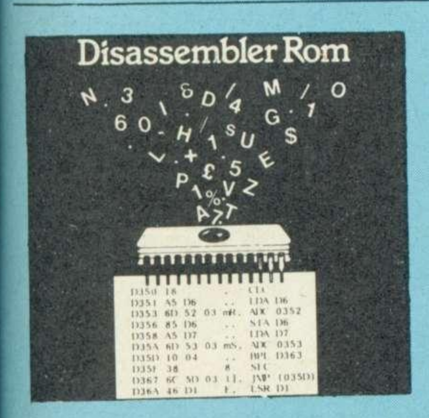
Only £22



Watford's own Machine code Monitor ROM written by Andrew Bray (Cambridge), co-author of the BBC Micro Advance User Guide.

The most powerful and versatile machine code monitor ROM yet written for BBC Micro. It has all the normal memory editing, moving and relocating facilities, plus all editing is with a full screen editor allowing scrolling up and down memory, entering in Hex, ASCII or standard assembler mnemonics.
In use as a debugging tool, you run code under a total emulation system. Ever felt a desperate urge to set a break point in ROM? No problem – you can even have breakpoint on reading or writing locations in memory and on register contents. The system fully supports debugging of sideways ROMs e.g. BASIC can fully and easily be run from within Beebmon and from there DFS and other sideways ROMs can be used in total emulation mode.
Beebmon can even run itself. In so doing you can nest Beebmon up to a level limited only by the memory size. Beebmon uses 256 bytes of workspace, located anywhere in memory, even on the 1MHz Bus. Beebmon effectively uses no zero page workspace, so your program (e.g. BASIC) can use any or all of the base page. How does it achieve this? By providing a 6502 interpreter all programs running under it exist in a vertual BBC, so special memory locations like the ROM latch are not actually accessed by your programs, instead they alter a location in Beebmon's workspace. Emulation also allows immediate return to Beebmon command level by ctrl-escape no matter what code is being executed at the time. All this exceptional power and flexibility is complemented by a clear and detailed manual included in a value for money price of:

£24

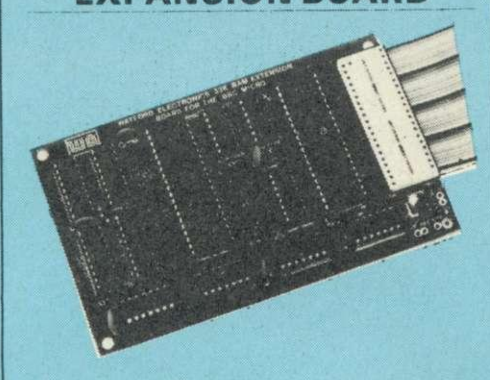


Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use progammers tool.
A ROM based machine code Disassembler for the BBC micro. It enables machine code programs to be listed in BASIC/DUMP format and thus is the perfect complement to the built in assembler. It allows Sideways ROMs, files on disk or tape to be listed, and also has a comprehensive editor, allowing mnemonics to be altered directly, as well as HEX, DECIMAL ASCII and BINARY memory editing. There is also a full set of labelling facilities available (up to 3,200 labels), with the major locations and routines already labelled.
Thus DIS-ASM enables any monitor program, such as BEEBMON to be used to much greater effect as it is not necessary to disassemble memory each time the display is altered.

ONLY **£18**

32K RAM

EXPANSION BOARD



Now Watford Electronics brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. It's ribbon cable simply plugs into your micro's 6502 processor socket. This compact board which fits inside the computer doesn't just give you 16k or even 20k of extra RAM, but a massive 32K!!!

There are many more useful facilities available with this board:

- The top 20K of the expansion RAM can be used as the screen display memory, leaving all the standard BBC RAM free for programs or data storage. This allows good graphics and long programs to be combined. For instance you could have MODE 0/1/2 GRAPHICS AND 28K OF PROGRAM SPACE. The extra memory can be used by virtually any language or utility such as BASIC, VIEW, WORDWISE (1.20+), WORDWISE-PLUS, etc. and NOW COMPATIBLE with Beebug's TOOLKIT.

- The FULL 32K or the bottom 12K of the expansion RAM can be used as a PRINTER buffer for SERIAL PARALLEL printers, sound channels, RS423, keyboard or speech synthesiser. This allows very long text files to be printed while you are using 28K of program and 20K of graphics! THE BUFFER IS UNIQUE because it replaces one of the BBC Micro's buffers so all the buffer options are available on it. eg. *FX15,21, 138, 145, ADVAL(–no.) etc.

- This board is the IDEAL COMPLEMENT to any WORD PROCESSING system, disc or cassette based. There is no need to wait for slow printers as you can type in long text in 80 column display mode while printing is going on – TWO JOBS DONE SIMULTANEOUSLY!!! (an equivalent printer buffer would cost you £120 +).

- Unlike our competitors, the board is compatible with a vast range of software and hardware available for the BBC microcomputer, including our ROM expansion boards, double density DFS units, and the ATPL ROM extension board. This is because our board is connected to the computer by means of a ribbon cable without soldering. It can either be left in the micro or stuck to the lid with the 4 self adhesive feet supplied.

- The board comes with a comprehensive manual and ROM based software with a large range of commands for machine code and BASIC users, including many *HELP messages.

- Now the ROM has had a host of utilities added to the large number already provided and has been made even easier to install.

Only: £65

GRAPH PAD

With this popular British Micro's Graph-pad, you can add new dimensions to your computer enjoyment. It helps you to create your own application programs by the simple use of the Graphpad. Ideal for Educational use. Supplied complete with Cables, Manual and a two program cassette.

SPECIAL OFFER **£86**

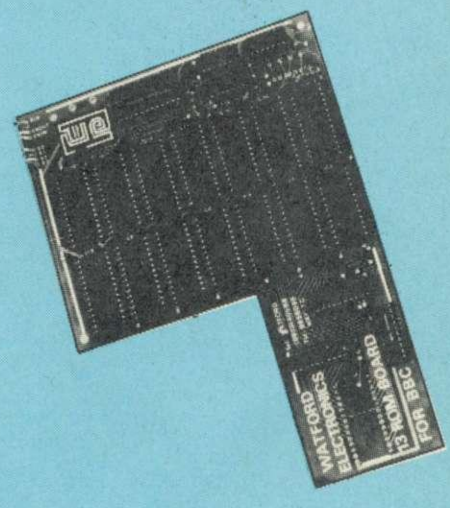
BEEBFONT ROM

BEEBFONT is a remarkable and different concept in BBC software supplied on a 16K ROM. It allows you to display text on the screen in 13 different styles:

It works in modes 0, 1, 2 and 4 using the full colour capabilities of each mode. Characters are printed in the same way as normal. Selection between the various fonts is very easily achieved with Ctrl-V – press this followed by a font number and the output will continue in the new font. Beebfont ROM is particularly useful in display work with the characters produced at twice the normal size.
You can create your own character fonts with the editor supplied. You can also print-out pre-formatted text files using the special characters with Epson FX, RX and NEC printers. The full range of character styles can be used, controlled from within the text. The editor and spooler program are supplied with the package, on cassette or disc. The spooler allows word processor (Wordwise & View) output to be printed in the new characters.
A twenty page manual is supplied. Please state printer type and media for the editor & spooler when ordering (cassette, 40 or 80 track disc).

SPECIAL PRICE
ONLY **£32**

Mk-2 13 ROM SOCKET EXPANSION BOARD



Now all lines fully buffered – On board battery back-up facility – will now accept EPROMS 2716, 2732, 2764 & 27128 and ROMs 6116 & 6264.
Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 5 solder connections to be made. Full instructions are supplied. Unlike other ROM Boards, this board has been ergonomically designed to enable the user, easy further expansion inside the Micro, e.g. Double Density Board, Torch Board, RAM Card, etc., without any clash. (At Watford, we think ahead).
Our Mk2 13 ROM Socket Board enables the User to increase the sideways ROM capacity from the basic 4 sockets upto full 16 capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.

All lines are fully buffered and the board meets or exceeds all timings for operation in the BBC Microcomputer. When fully populated, the ROM Board consumes less than half the recommended maximum current limit.

Supplied ready-built and tested complete with fitting instructions.

SPECIAL OFFER: £30

Continued ▶

COMPUTER CONCEPT'S ROMS

CARETAKER Basic Utility	£28
Graphics ROM	£28
Disc Doctor ROM	£28
TERMI	£27
COMMUNICATOR	£58

Wordwise

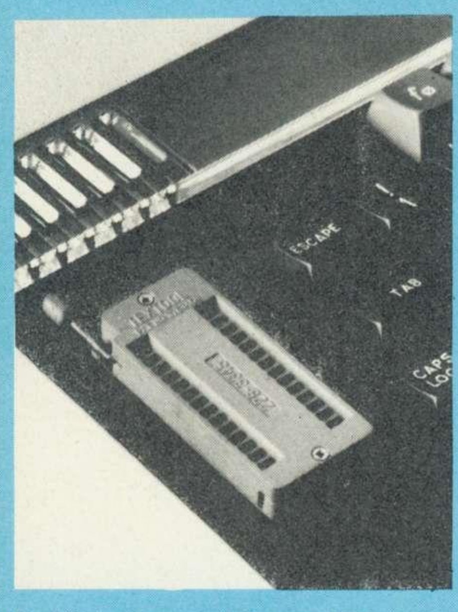
Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER THIS MONTH: **£32**

WORDWISE PLUS

Now available from stock **£49**

SIDEWAYS ZIF SOCKET



Now Watford Electronics brings you a ROM board for small budgets or for those of you who do not wish to open up your Micro frequently. It allows you to change ROMs quickly and efficiently with the minimum of effort – no screws to loosen or keyboard to remove. The unit consists mainly of a zero insertion force (ZIF) socket on a small circuit board which is located into the position of the 'ROM Cartridge' and is connected to one of the internal ROM sockets via a ribbon cable.

- Very simple to install. NO SOLDERING REQUIRED. The ZIF eliminates the possibility of damage to your ROM pins when inserting and extracting them.
- The low profile of the socket allows unrestricted access to the keyboard, unlike other cartridge systems. In addition, there are no costly extras, such as ROM cartridges for every new ROM.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space, simply unplug the ROM and plug in a different one. It is a real must for Professionals and Hobbyists alike.

ONLY **£18**

WORDWISE PLUS UPGRADES

Existing users of Wordwise can upgrade to WORDWISE + for £17. Please return the old WORDWISE package complete with Chip and MANUAL with your remittance and we will send you the new WORDWISE + package.

£17

BEEBUG SOFT

SLEUTH ROM	£25
TOOLKIT ROM	£23
ACORN 1.2 DNFS ROM	£15
ACORN 1.2 OS ROM	£10
ACORN BASIC 2	£20

APPRO[...] for use with teleco[...]on systems run by Briti[...]unications in accorda[...]s conditions in the ins[...]s for use.

MODEM 84

PRESTEL TERMINAL

For the BBC Microcomputer



The Watford Prestel package consists of the B.T. approved Watford MODEM 84 (1200/75 baud full duplex 1200 baud half duplex direct connect) and a very sophisticated Prestel Terminal ROM. Please write-in for full technical literature.

PRICES

MODEM 84 (with Lead & Manual)	£55
MODEM 84 complete with PRESTEL SOFTWARE ROM, Lead and manuals	£75
PRESTEL SOFTWARE ROM + Manual	£20
USER to USER 1200 BAUD SOFTWARE ROM	£18

(At these incredibly low prices for such a sophisticated BT Approved Prestel Terminal, Modem 84 has to be the best buy around)

(Carriage on Modem £2)

Nightingale Modem

Now Watford brings you PACE's NIGHTINGALE MODEM PACKAGE including the popular Commstar ROM software for the BBC Micro. Nightingale is considered to be by far the most versatile BT approved modem available at the price for the BBC Micro. It is ideal for home or business use. It offers Prestel/Viewdata baud rates (1200/75 & 75/1200) as well as 300/300 baud full duplex for communication between BBC and other computers, including bulletin boards. A bargain at our

SPECIAL INTRODUCTORY OFFER

(Price includes COMMSTAR ROM & comprehensive manuals) **£119**

COMMSTAR ROM package **£29**



16K DISC RAM

This is the RAM you've been waiting for!! This battery backed up, write protectable 16K sideways RAM board allows you to run from disc every sideways ROM available. Beware of other sideways RAM boards which are not backed up as certain ROMs will not run in these boards even though the RAM can be write protected. The Battery Backup facility allows retention of DATA after power off. On switch on the Micro will think the WATFORD DISC RAM is a ROM. Features available are:

- No soldering or modifications to BBC micro necessary.
- Plugs into normal ROM socket fitting neatly under the keyboard allowing room for other add-ons.
- Easy to use. Comes with disk based software to SAVE and LOAD ROMs. Allows you to make backup copies of your ROMs.
- Disk software can be copied onto other discs when disc is full.
- All existing ROMs can be stored on disk and used in DISC RAM.
- No messy plugging and unplugging of your ROMs. Simply Load the one you want into DISC RAM.
- Ideal for Professional users to develop ROMs. Backup facility allows testing of final versions without using EPROMs.
- The switch provided allows backup and write protection to be switched off externally.
- Can also be used as 16K printer buffer RAM.

Only: **£39**

P.S. 16K DISC RAM Board is not designed to work in conjunction with a Sideways ROM Board.

Versatile BEEB SPEECH SYNTHESISER Unit



SIMPLY the best! – An unlimited speech synthesis system. Complete with easy-to-follow manual. Controlling software is in ROM so no Cassette Loading problems!

PHONEMES for word synthesis – That means unlimited vocabulary! No extra speech dictionary chips to buy!

BUILT-in Library of approximately 500 words to get you started.

ENGLISH accent – Utilises inflexion techniques to produce highly comprehensible speech.

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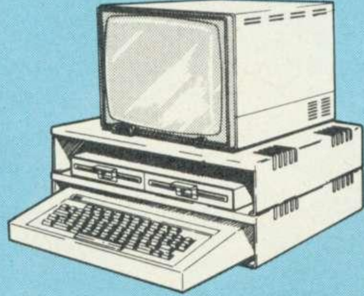
To summarise this superb product a comment passed by a very senior authority on BBC micro at the last Micro User Show was, 'My only criticism of the product is that, IT'S TOO CHEAP!'



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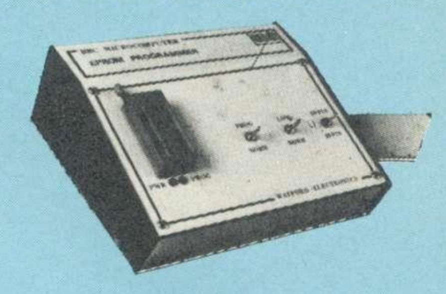
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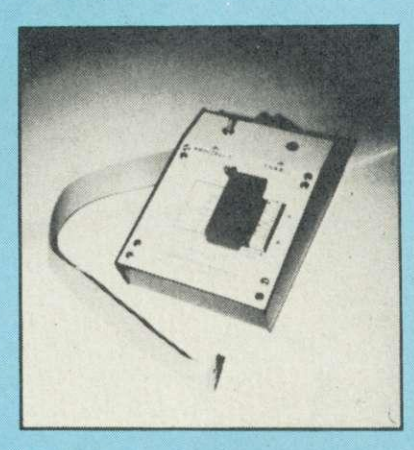
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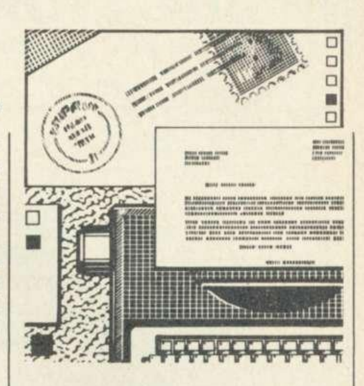
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New move for White Knight

Sir, I have read with some alarm that the author of the BBC Chess, Mr Bryant, has 'defected' to Commodore and written a superior program that has decisively defeated the *White Knight*. I hope this will not preclude him from publishing an improved version of the *White Knight* soon. But I must add a plea to my earlier suggestions in your columns some months ago for a disc version, and a disc that would be compatible with the second processors. I don't mean a program that would utilise the extra memory (although this would ultimately be very much appreciated judging by the fact that *White Knight* is consistently in the Top Ten), but merely for compatibility when the second processor is connected but switched off and the micro should behave, according to the manual, normally. Well, it does *not* behave anything like normal.

I have recently purchased the Acorn Z80 only to discover that *White Knight* (and other more complex programs) will not run with the processor switched off, either in the tape version or transferred to a disc, unless the connecting cable is actually physically pulled off the Tube connector every time. At best it worked for a few minutes from cold before it crashed, but would not even load when warm.

I would be very grateful if you could offer a solution to this problem (affecting, as it does, many other computer applications when the CP/M is not needed) without having to disconnect the cable, which in my case needs two people as it is so short, and would surely wear out if the original BBC Basic and the CP/M were to be used regularly.

I would also like to know if there is any way of implementing the command *TV255 on the second processor in CP/M – I cannot read the top lines of the software provided and normally in Basic the monitor is only occasionally in need of the command so I would not like to interfere with the TV tube adjustments.

Another query is that the Z80 *MemoPlan* wordprocessor has an automatic line feed but *View* has not. Unfortunately, I cannot make the *FX6,0 command work from within *View* and so I have to choose one or the other wordprocessor or open the printer all the time. Is there a simple solution?

One would assume that the bundled software claimed to be worth £3000 should be superior, but good as *MemoPlan* is, it lacks some vital features I sometimes need – such as using the full capabilities of the printer, especially all the fonts, italics, etc, within the same text. Can this be done?

As well as line feed control problems, the wordprocessor does not appear to have any line spacing choice, unlike the printer. Is it possible to send any commands to the printer? Neither the manual nor technical assistance provided any real help.

R B Vočadlo
London



The most powerful version yet

David Atherton of BBC Soft replies: BBC Publications are pleased to announce that the successor to the *White Knight Mk 11* chess program was released in January. *White Knight Mk 12* is over four times as powerful as its predecessor having an estimated rating of 1850+ELO (156+BCF), and we expect that it will prove to be the most powerful chess program yet produced for the BBC micro. The program is available on cassette at £9.95, but a disc version, compatible with the 6502 second processor will be available soon. In answer to your other queries, no 6502 m/c software will run on a Z80 second processor, and if software doesn't know about the extra memory, or doesn't need it, then it won't use it.

Richard Boyd of Acornsoft Customer Services replies: With the Z80 second processor connected but switched off, the BBC micro should function normally and run programs that would run as a stand-alone machine. The Z80 is totally dormant when off, and the BBC machine is unaware that the unit is still connected. However, all second processors do put a slight additional load on the BBC address and data bus, in the same way as an additional sideways ROM.

The problem could well be that your BBC micro cannot take this extra load and is unable to take the extra strain of a second processor. I would suggest that you return your machine to the dealer who sold you the Z80 for the repair necessary.

There are two ways to bring the screen down using the *TV command detailed in the BBC User Guide. First, press Break on its own and a '*' prompt will then appear. Type in the *TV255,n command and on a new line type in CPM to boot CP/M from disc. Then when you enter an application such as *MemoPlan* the screen will be moved down. The second way to do this is to use the 'STAR' utility from the Utilities Disc which allows you to enter the BBC Operating System call.

We have not come across the problem of *View* not accepting *FX6,0 when it has been entered on a command line before a Print command.

We have noted your points on *MemoPlan* and are looking forward to introducing *DocuPlan*, and an advanced printing and formatting utility will be available for purchase in the near future.

Another tune for the Beeb

Sir, Readers of Joe Telford's article 'Orgmentation' in the December 1984 issue of *Acorn User* may be interested to know of the design for a music-keyboard interface for the BBC micro which has been developed here at the University of Lancaster Centre for Research into the Applications of Computers to Music.

This is a four octave, fully polyphonic design using a conventional type of electronic organ keyboard which can be used to play the micro's sound system directly but is also intended to be used with the comprehensive music education software which we are currently developing. Details were published in *Electronics and Wireless World* in July and December 1984.

The Lancaster ITec. Centre has now designed a PCB for use and we will be supplying kits of parts for the interface early in the year. The price is expected to be around £60 to include the keyboard, PCB, all electronic components and connecting cable. Anyone interested is invited to send us a SAE and we will send full details as soon as they are available.

R M Adelson
University of Lancaster
Centre for Research
into the Applications of
Computers to Music,
Music Department,
Bailrigg,
Lancaster LA1 4YW

Address unknown

Sir, In the February 1984 issue of *Acorn User*, a letter from O P Alexander of Dorset referred to the program INFORM from the Nottinghamshire Computer Centre.

Could you please tell me how I can contact the Nottinghamshire Computer Centre to obtain information on INFORM.

Joseph Day
Gloucs

Unfortunately we don't have the address, but we'd be grateful if anyone can let us have it so we can pass it on.

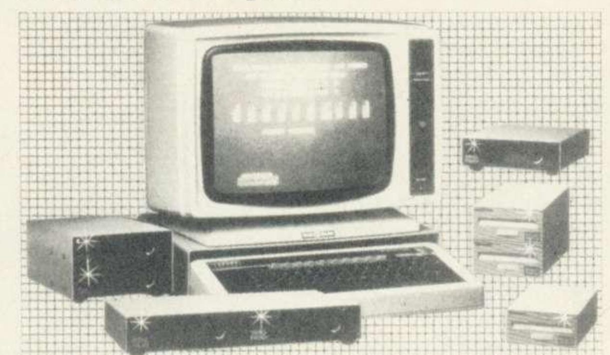
page 59 ▶

ASK a silly question, pass a fair comment, stage an angry protest – we don't mind what you write to us about (or about us!). Keep 'em short, keep 'em sweet, but keep 'em coming! The address is: Letters, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

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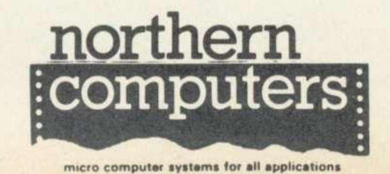
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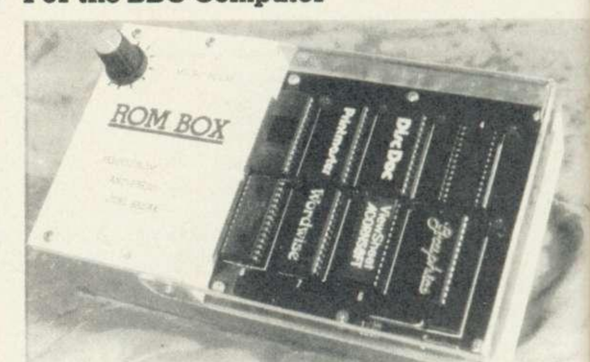
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Tel: Frodsham (0928) 35700 (10 Lines)

Do software houses condone piracy?

Sir, More than once software piracy has been discussed in your magazine and more than once software houses have expressed their wish that something should be done about it. I discovered a few months ago how much they are interested. Here in my hometown in Europe there happened to be some shops selling illegal Acornsoft and Computer Concepts software (discs, tapes and EPROMs). Now, I am not too concerned about that but what bothered me is that they passed it off as being original, and therefore asked the normal price.

I also happened to know that due to a faulty EPROM-blower they sold 'genuine' Acornsoft and CC software that didn't work. Really nice for the company's names, isn't it?

Since I didn't think the companies deserved this I decided to blow the whistle on these shops to Acornsoft and CC, so I informed them, giving the names and addresses of the shops concerned. I made it clear that I had no personal grudge against the two shops, since I never bought any software there, and therefore had no reason to feel cheated. I also wrote that if they wanted to prosecute they should contact me for further details. Neither Acornsoft nor CC answered.

This all happened in July as far as I recall and both shops are still selling copied software. So I guess that Acornsoft and CC (although the latter states otherwise in its manuals) are not really interested in prosecuting professional pirates. My advice to your readers: If you know a shop selling illegal software, buy it, don't report it, as software companies don't seem to mind. If Acornsoft or CC change their minds, they should have my letter and address somewhere.

Name and address witheld

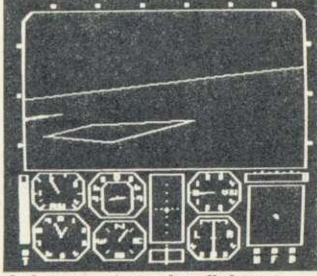
We informed Computer Concepts and Acornsoft of the contents of this letter – here are their comments:

R B Moir of CC replied: Of course we, like all other software companies, are seriously troubled by the widespread copying of our products that we know goes on. We spend a lot of time and money endeavouring to track down sources and obtain firm evidence of piracy with a considerable amount of success in this country. However, the added complexities of attempting legal redress abroad is daunting to say the least. We are grateful for the time and trouble taken by your reader to inform us of this matter and we have now contacted him to see if there is some way in which we could try to deal with this particularly flagrant case of piracy.

And David Johnson-Davies of Acornsoft replied: I am very concerned that we have no trace of the original letter to us, so it appears it may have gone astray in the post. I can assure you we are very concerned about piracy of our products and we follow up every case of this sort which comes to our attention. I am particularly worried about the effect it may have on our reputation since the pirated copies are seldom up to the standard of the original. In discovering evidence of such piracy we often rely on concerned purchasers like yourself and I must commend you for having taken the time to write to us.

Aviator – praise from a pilot

Sir, I must leap to the defence of *Aviator* as a flight simulator, since I believe it is quite unjustifiable for Phil Rimmer (Letters, *AU* January) to compare this program with one like *Jumbo* which deals with the vastly different problems of controlling a large jet airliner.



Aviator – as good as flying lessons?

To me, *Aviator* models beautifully a lively, powerful, aeroplane with finger-light controls. I found few problems in taking off, finding my way around the country and doing simple aerobatics. I also managed to approach the airfield for a landing, but as a pilot with 49 years experience, I was humiliated by my inability to make a successful landing on the runway. After much practice I can now perform this, but only on about two out of three attempts!

It is true that it is *not* good practice (to say the least!) to try to put such an aircraft onto the ground using altimeter, a.s.i. and throttle only, with a minimum of visual clues – perhaps this is what worried Phil Rimmer?

I expect other users have discovered many interesting features of *Aviator*. For example, I have found out that the lake, south of the bridge, apparently freezes over in winter. On a cold day last week I was able to land on the lake and, taxying carefully across the ice, to pass underneath the bridge. After that I took off again towards the north from the frozen river.

I would recommend anyone to spend at least a few hours with *Aviator* before taking flying lessons.

John Simpson
Cambridge

Have you tried landing upside down? Try it – reader C Beesley assures us it can be done.

The vicious circle of Elk software

Sir, I have been most disappointed and annoyed to find so little software in the shops for the Acorn Electron, especially educational programs, and I should be glad if you could give me more information on what is available.

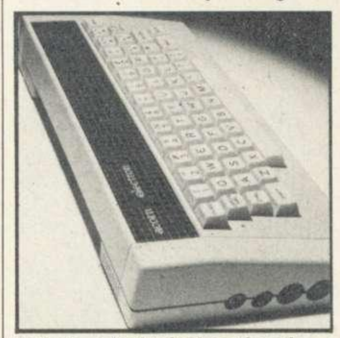
We are told by shops that the Electron is not a popular machine, so they do not stock the software, but it is never likely to be popular if there is so little software in the shops. We had thought this was the best computer, expecting there to be far more educational material available.

Sylvia Powers
Coleshill

K L Spence of Kosmos Software replies: The problem is nothing to do with the Elk. Basically, shops prefer to fill the shelves with games because they sell in greater quantities and therefore bring in more profit.

The problem is compounded by similar views held by most software wholesalers. This means that even if shops want to stock educational software they will often have to buy it direct from the software houses, and they prefer not to do this because it means more accounts, more invoices, more cheques to issue, etc. Thus many shops will give you the most amazing excuses for having no educational software in stock.

The Electron is in our view still the best machine available for anyone who wants something more for their children than games. There are, of course, plenty of games available, certainly enough for most users' requirements. What the Electron offers (and I'm sure many shop assistants do not even realise this) is language compatibility with the BBC machine – as used in most UK schools. Thus any actual programming learnt at school may be practised at home on the Electron. A knowledge of computing and programming is of fundamental importance for our children's future – not an ability to play several thousand different games.



Is there a lack of educational software for the Electron?

The views expressed in your letter concerning the lack of educational software are shared by most Electron users, and I can only offer the following advice.

Read the news items and program reviews in computer magazines; they are usually a fair indication of what you can expect a program to contain. Decide what you want to buy and ask your local shop to obtain it. Don't accept excuses and don't take no for an answer. It should take less than a week for a shop to obtain any program you require. If you have no success or if you prefer a faster response, then contact the software house direct.

Look out for our special education section, and compatible listings in *Acorn User*. [Ed]

page 60 ▶

The French Econet connection

Sir, We are a large university laboratory in Paris, with a number of BBC microcomputers which we have connected in an Econet network. We are looking for a way of using a high-capacity disc to serve the network. We have a 20Mbyte Winchester with a Xebec controller which we could use if the appropriate interface and software were available. We could possibly also purchase the new 1Mbyte or 5Mbyte floppy disc systems. The Acorn hard-disc file server has not yet really appeared, and apparently does not support a Xebec controller.

Could you give us a list of Econet suppliers please? Is there some publication which is more oriented towards laboratory use of BBC machines than *Acorn User*? It might also be helpful if you could publish our address so that anyone reading this could contact us: Groupe Regard, Laboratoire de Psychologie Experimentale, 28 rue Serpente, 75006 Paris, France.

J K O'Regan
Paris

Contact Acorn Overseas at Fulbourn Rd, Cherry Hinton, Cambridge CB1 4JN. They will be able to give you the latest details of Acorn's Winchester and Econet file servers and the addresses of any suitable dealers in France.

Seeing stars on the screen

Sir, Thank you for printing Professor Wickramasinghe's friendly review of my BBC Soft *Astronomy* suite, (*Acorn User* January 1985).

However I too have written a 'starmap' package, published by Heinemann Computers in Education (disc only), which plots an accurate starmap of the whole, or part, of the sky as seen from any location at any time/date. The plot is in mode 0 and therefore exploits the hi-res graphics to the full, and the star catalogue contains 1068 stars, more than twice as many as either of the other suites reviewed.

A complete plot of the whole sky takes about two and a half minutes, though faster plots of fewer stars are possible as they are deposited on the screen in order of decreasing brightness.

An updated version which plots planets on the starmap, allows their motion to be followed, identifies all the stars, plots nebulae and other interesting objects and marks all the constellations, will be ready in a couple of months.

John Banks
Herts

Software sleuth

Sir, As avid readers of your magazine and newcomers to BBC computing, we write to ask for advice. In setting up a school computer literacy programme we wish to find three specific pieces of software, and wonder if you could help us find these:

1. *Animal* in which the computer is 'taught' by the student to ask questions classifying information. (Introduction to databases.)
2. Spreadsheet on disc; not too many cells, but simple to operate by young students. Is there a program called *View-Calc* on disc?
3. *Mary Rose*, a database-type program (?) often referred to in *Acorn User* but without ever mentioning where it can be bought.

Peter Benson
Director of Studies
Aiglon College
1885 Chesières-Villars
Switzerland

***Animal* is published by Techmedia as one of eight programs in Micro Primer pack 1. This is subsidised by the MEP who are funded by the British Government to help introduce micros to schools (see reviews March and April 1983). It is designed for primary/middle schoolchildren and comes on cassette. Details from Techmedia at 5 Granby St, Loughborough LE11 3DU. Tel: (0509) 230248.**

***Vu-Calc* and *Viewsheet* are both spreadsheets. The first comes on cassette which can be transferred to disc and costs £14.95 in Britain. It's published by Psion at 2 Huntsworth Mews, Gloucester Rd, London NW1 6DD. *Viewsheet* is from Acornsoft at Betjeman House, 104 Hills Rd, Cambridge CB2 1LQ. Tel: (0223) 316039. It comes on ROM. (See comparative review in the February issue.)**

***Mary Rose* is a simulation/adventure package based on the recovery of a Tudor warship of the same name from Portsmouth harbour by a team of marine archaeologists. It was reviewed in the February 1984 issue and referred to in a discussion of similar material in April 1984. *Mary Rose* is designed for children aged nine and upwards and is available on disc and cassette from Ginn, Prebendal House, Parson's Fee, Aylesbury HP20 2QZ.**

Latest round-up of games high scores

Aviator	Acornsoft	30,450	**P Hopgood***
Android Attack	Computer Concepts	1,132,985	**Jon Button***
Arcadians	Acornsoft	72,820	**A Norgate**
Battletank	Superior	98,640	**Adrian Foster***
Chukkie Egg	A&F	30,275,420	**Stephen Corcoran**
Crazy Painter	Acornsoft	279,790	**Richard Arundale***
Cybertron Mission	Micro Power	214,540	**Mark Bradshaw***
Fortress	Pace	117,500	**D Shavick**
Frak!	Aardvark	498,600	**David Perry**
Free Fall	Acornsoft	3,800	**David Perry**
Hopper	Acornsoft	44,811	**John Durrans***
JCB Digger	Acornsoft	119,500	**David Perry**
Killer Gorilla	Micro Power	672,550	**O Beman***
Meteors	Acornsoft	430,120	**Malcolm Duncan**
Missile Control	Gemini	101,125	**Nicholas Jackson**
Monsters	Acornsoft	257,060	**Ian Cook***
Mr Ee	Micro Power	243,350	**Stephen Corcoran**
Moonraider	Micro Power	583,750	**Lindsey Tasker***
Overdrive (BBC)	Superior	338,450	**David Perry**
Overdrive (Electron)	Superior	771,520	**Matthew Ede**
Painter	A&F	144,740	**Richard Arundale***
Pengo	Watford	173,000	**Damon Futter***
Planetoids	Acornsoft	2,896,500	**David Perry**
Pole Position	Atari	147,200	**D Hughes***
Rocket Raid	Acornsoft	101,400	**Keith Simms**
Snapper	Acornsoft	639,260	**Peter Simpson**
Space Adventure	Virgin	4,680	**Gareth Dykes***
Starship Command	Acornsoft	5,210	**Brian Weatherill***
Zalaga	Aardvark	11,350,200	**Stephen Corcoran***

** Scores unbeaten since February*

Safety measures

Sir, As I was installing my sideways RAM board in my Beeb I had a glimmer of an idea regarding identifying the Beeb as a piece of stolen property. Part of the Beeb could be engraved with the owners' name, address and postcode, in several places (eg, bottom of plastic case, top of transformer case or even the top of chip marked 8313 in the centre of the PCB).

This may not be a very good suggestion as a deterrent, but it may enable the Police to return your computer to you, should it be found, instead of collecting dust in the lost property shed at the local Police station.

On another topic, I and probably many others would be very interested in some articles referring to the advanced graphics manipulation using machine code used in arcade type games. I find your articles very well worded, and much easier to understand than available books.

All in all you produce a very good magazine stuffed with useful and informative articles and deserve a pat on the back.

G Moore
Suffolk

CENTRAL PROCESSING...
CENTRAL PROCESSING...

M Magennis, Sheffield
The 8271 disc controller chip as used in the standard BBC micro disc interface is not capable of double density format.

Philip Walton, Salford
The memory between &D00 and &DFF inclusive should not be used for any program or data storage whatsoever. This area is reserved for use by interrupt service routines and paged ROM data tables.

Dr F Crossley, Congleton
A review of the Phloopy is currently under way.

Gregory Boland, Woodley, Berks
You obviously have a corrupted disc. The disc fault at 00/01 suggests that it is the catalogue information that is damaged. You can retrieve your files and transfer them onto another disc using a suitable disc sector editor, such as Computer Concepts' *Disc Doctor*. You should always keep backup copies of your disc either on another disc or on a backup tape – but you know that now!

Laura Blackburn, Stourport-on-Severn
The reason you are getting a Bad filename error is because you are not leaving spaces between each item. The entire line should read:

```
*SAVE ISAVE 8D0 9B0 8D0
```

Note the spaces.

E Watleiss, Harlow
Electron add-ons are covered in the February issue of *Acorn User*.

B Beeston, Enfield
The Design listing printed in the September issue of *Acorn User* will work correctly, as it stands, on Basic 2. It is possible to use ON ERROR PROC . . . in Basic 2 as long as the line is terminated with END. ie:

```
ON ERROR PROCerror:END
```

Lines 1 to 6 in the listing should be deleted as specified in the text.

Michael Smith, Swansea
Acorn will be producing an RS423 cartridge for use with the Plus-1. No release date has been announced as yet.

Piers Stainforth, Denmark
The 'byte' error occurs when you try to assemble an immediate operand that is larger than 255. For example LDA #257 would generate the error.

Ian Wills, Bristol
We hope to carry a disc special in the July issue. This should contain articles and reviews on DFSs, discs and utilities.

M Powell, Brussels, Belgium
The reason PRINT STR$(4.7) produces 4.699999999 is not so much a bug but occurs because of the way floating point numbers are normalised and stored internally – the rounding off process. It can of course be circumvented by writing a short FN to round off to the required number of decimal places.

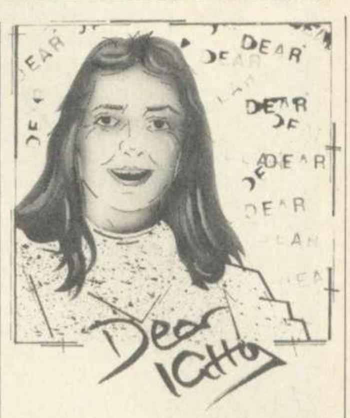
G Litman, Wembley
Unfortunately we do not have any further information on the Communicator at present, but watch the news pages . . .

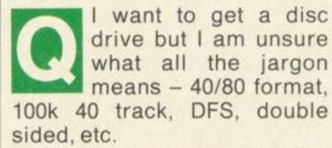
T Hill, Midlothian
There are a few programs on the market that would help you with your Income Tax problems (but they won't pay the bill!) – try BBCSoft's *Tax Calc 2*, price £17.25.

Desmond Hamilton, Crieff
View will work on the Econet system, but you will still need a *View* ROM in each machine. Files can then be loaded and saved as normal using the NFS.

Due to the large amount of technical enquiries we receive in the *Acorn User* office we are now unable to reply to individual letters. However, this new feature is intended to answer as many of your queries as possible, and should provide a useful information spot. Please keep your letters short and to the point.

You ask Kitty how to decide which disc drive to choose





Q I want to get a disc drive but I am unsure what all the jargon means – 40/80 format, 100k 40 track, DFS, double sided, etc.

I hope to use my micro for wordprocessing, so what would be the best disc drive to get?

Peter Smith
Essex

A First, let me say watch out for our July issue as this will have a distinct disc and ancillaries theme!

To allow your BBC micro to use discs you need a special program that provides some suitable new commands. This software is called the Disc Filing System (DFS) and is contained in a ROM chip which plugs into a vacant sideways ROM socket. There are several different makes available but the standard version is the Acorn DFS.

Many advertisements mention double density DFSs. Basically these allow you to store twice as much information on a disc than it is possible to keep on a 'standard' single density disc. This can lead to compatibility problems however, so if you decide on a double density system make sure that it can be used with *all* software.

The term 'track' refers to the number of concentric rings on the disc capable of storing information. The two main types are 40 track and 80 track. To enable the DFS to find its way around a disc and know which track is which, it must mark the disc electronically – a process termed 'formatting'. It's not possible to use an unformatted disc.

Discs may be double-sided or single-sided – in other words, you can use either both sides or one only, but this will depend on the disc drive you have. More about this in a moment.

As regards the amount of data it's possible for you to get on a disc, a good guide is to think in terms of 100k per 40 tracks per disc side. So, a 40 track single sided disc has 100k of space, a double sided 40 track has 200k, an 80 track single sided has 200k and a 80 track double sided has 400k.

Disc drives are expensive and what you purchase will ultimately depend on what you can afford.

You can get either a single or a double disc drive – the former will accept one disc at a time and the latter will take two. A twin disc drive is nearly twice as expensive as a single one, but it is much more convenient as it allows you to copy discs easily and access two discs from one program, which is useful when dealing with databases or spreadsheets. Both of these tasks can be performed using a single disc drive, but a lot of swapping of discs is needed.

Because discs may be double sided, so may drives – again this applies to single or twin drives. It is preferable to have a twin drive rather than a single double sided drive.

The number of tracks is very important: 40 and 80 track discs are not transferable. 40 track drives are more common than 80 track ones but the latter provide you with a greater storage capacity per disc.

Most software these days is available in both formats so there should be no problems on this front.

Finally, there are switchable drives. These allow you to switch between 40 and 80 track discs. They are the most expensive but if you can afford them, the best!

As to which particular make of drive to choose, I suggest you look out for the special disc issue for advice, but there seems little to choose between them, so the one that suits your pocket and fits onto your desk will probably be the best for you.

PRINTERS

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All printers have centronic parallel interface unless otherwise stated. All printers have hi-res dot addressable graphic mode. Please send SAE for full details.

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Ribbon Cartridge for RX80 FX80 & MX80	£5 + VAT	**£6**
Ribbon Cartridge for FX100 & MX100	£7 + VAT	**£8**

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SEIKOSHA

BP 420 designed for the business world, 420CPS in draft mode, 110CPS in NLQ mode. — £1095 + VAT **£1259**

SMITH CORONA

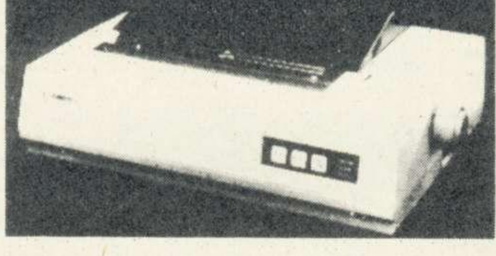
Fastext 80: 80 col, 80CPS. Friction feed standard — £149 + VAT **£171**

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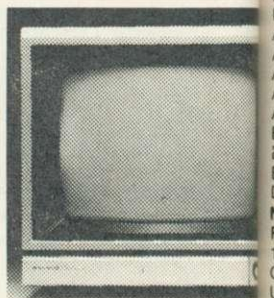
ACORN

SANYO MONITOR

SPECIAL

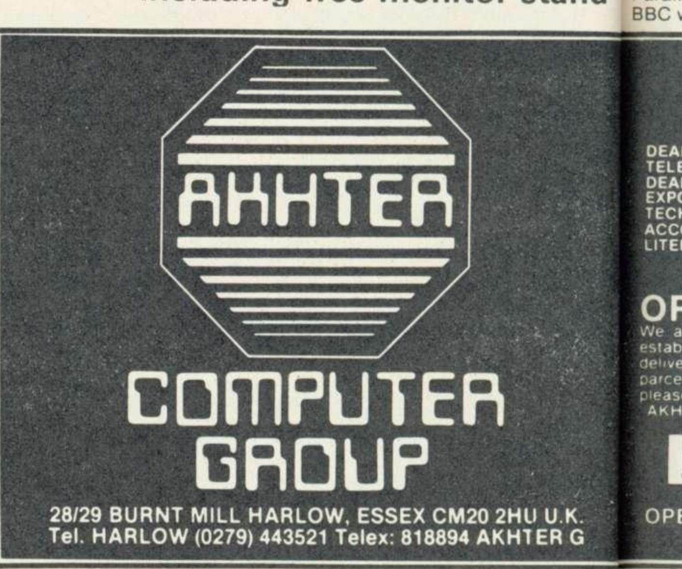
CM 3125

colour monitor



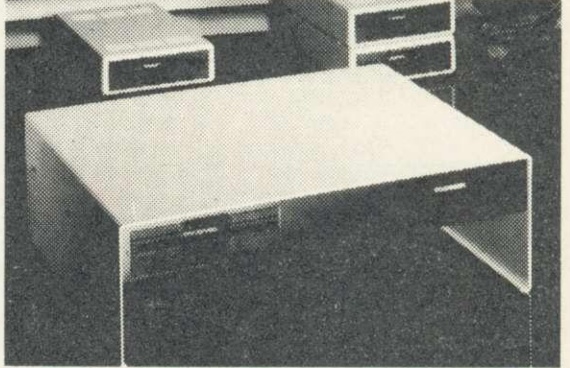
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DISC

100% BBC COMPATIBLE MITSUBISHI AND TEAC SLIMLINE DISK DRIVES



These drives are supplied ready cased with all the necessary cables formatting program and User Guide
There are some very useful utilities included on formating disc e.g.

- DISASSEMBLER: This is 6502 machine code disassembler
- DUP: To copy and rename a file on disc
- FORMAT: Formating progam for 40 & 80 tracks
- FREE: This utility provides a disk usage analysis
- MDUMP: Enables you to display and modify any part of BBC memory
- MERGE: Merge a number of text files into one file
- RELOCATE: Downloads a basic program to &E00
- SDUMP: Screen dump for EPSON In all graphic modes
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PRODUCTS

BBC Microcomputer Model B	£299 + VAT	£344
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Acorn IEE Interface	£282 + VAT	£325
Acorn Electron plus 1 interface	£52 + VAT	£60
BBC Prestel Adaptor	£115 + VAT	£132
BBC Telext receiver (Aug)	£196 + VAT	£225
BBC cassette recorder and lead	£30 + VAT	£35
Disk interface kit (free fitting)	£103 + VAT	£118
Mod A to Mod B upgrade kit	£70 + VAT	£80
Fitting charge for A to B upgrade kit	£20 + VAT	£23
16K memory upgrade kit	£30 + VAT	£34
Games paddles	£17 + VAT	£19
User Guide	£15	
Advanced User Guide	£12.95	
Econet Guide	£ 7.50	
Econet interface (free fitting)	£60 + VAT	£69
Speech interface (free fitting)	£47 + VAT	£54
BBC disk manual - formating disk	£30 + VAT	£34
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Dual drive 800K 40 80 trks switchable DS	£312 + VAT	£359
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All above drives are low power slimline (0 3 A typ at + 12v and 0 4 at + 5v per drive) Normally extra power supply is not required. The BBC Computer power supply is designed to drive to low power drive (IT IS NOT DESIGNED TO DRIVE INTERNAL ROM BOARD)

SS DD disketts (10 Box) £18 + VAT **£20**
DS DD disketts (10 Box) £23 + VAT **£26**

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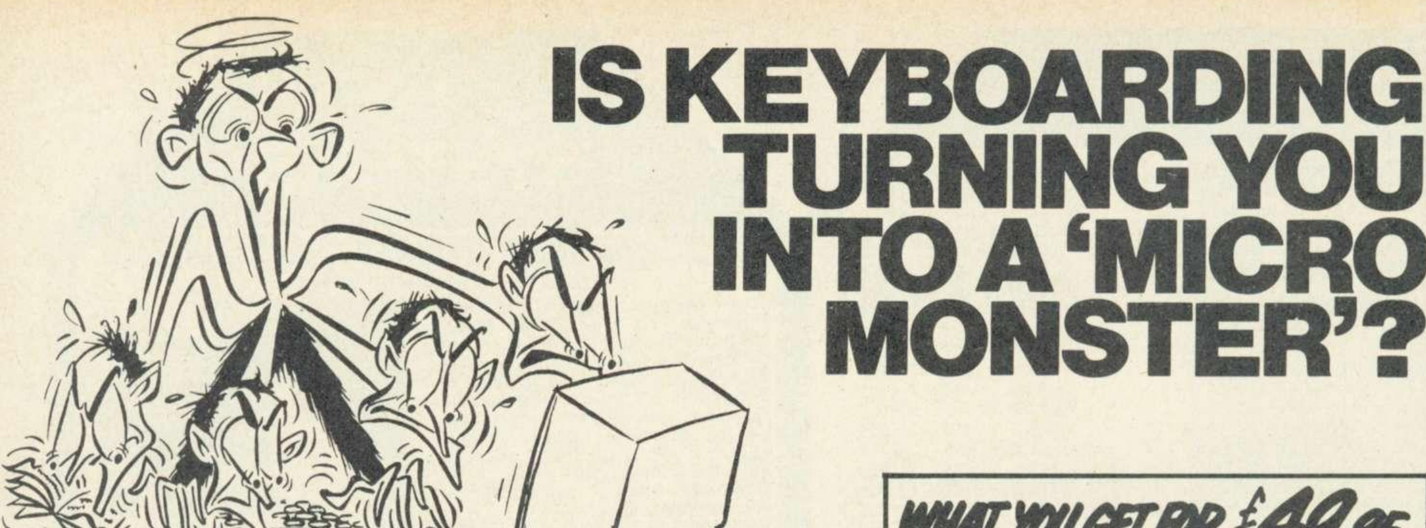
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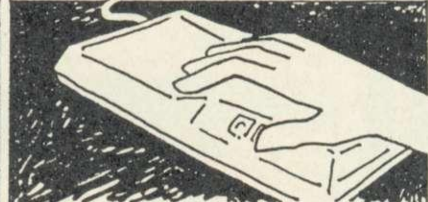
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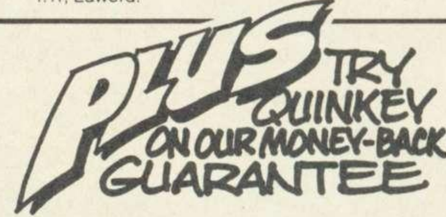


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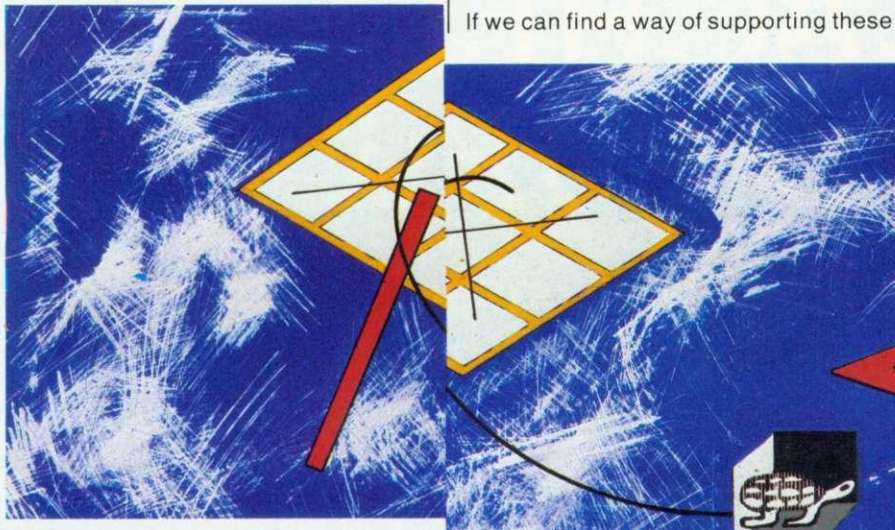
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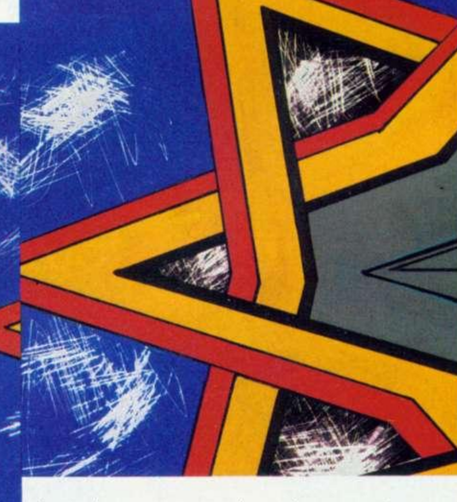
AU 4/85

THE LANGUAGE FOR LEARNING

Logo is a very powerful tool in teaching problem-solving skills. Joe Telford begins a two-part in-depth assessment

IF WE make a list of the most important skills of people in society, high on it will be the ability to solve problems. Regular readers of Jottings will know what I think of the 'If two men can dig a ditch in three days . . .' type of problem. It is a mathematical exercise and has a place, albeit a small one. In real life people come across many problems which almost always start off: 'How can I . . .' Solving these problems is often difficult for adults, let alone young children. Often the younger user has developed no problem-solving skills or strategies, for their development requires continual exposure to problems, as well as guidance towards the solution.





Supporting the learning of general problem-solving skills is difficult for parents and teachers alike – indeed, it has been recognised that problem-solving is a weak spot in both adults and children across the whole country. The wide differences between various kinds of realistic problems makes it difficult for children to transfer an approach for solving one problem to another problem. There are, nevertheless, many skills that support problem-solving which are general enough to be transportable. These include skills of:

- Logic/argument
- Reasoning/prediction
- Ordering/sequencing
- Hypothesising
- Testing
- Analysing
- Fault-finding (debugging)
- Design
- Recording
- Prototyping

If we can find a way of supporting these general skills then we are helping with general problem-solving. There are, of course, many ways of addressing the task of problem-solving. In the September '84 issue we considered using programming as an approach. Feedback from Secondary school teachers was quite positive, but the feeling was that the techniques involved were on a par with the abilities of 14-year-olds rather than younger children.

If we could use the programming environment with younger children then this approach to problem-solving could become valuable. If a programming environment could stimulate youngsters to think 'What if . . . ?' then we have the beginnings of self-motivated learning. Those who think this doesn't occur should look at the youngsters who play advanced games like *Elite*. Better still, look at the youngsters who write such games.

Before getting carried away, we must remember that the English educational system has always placed emphasis on the position of teacher as facilitator and director of each child's learning, so our imaginary programming environment needs to be teacher-friendly, enabling him or her to manipulate it to support skills other than those mentioned above – reading, text composition, editing and spatial awareness, among others.

What is Logo?

Logo is often spoken of as the most powerful computer language for learning. The name itself derives from the Greek word for thought, and hints at the language's support for logical thinking.

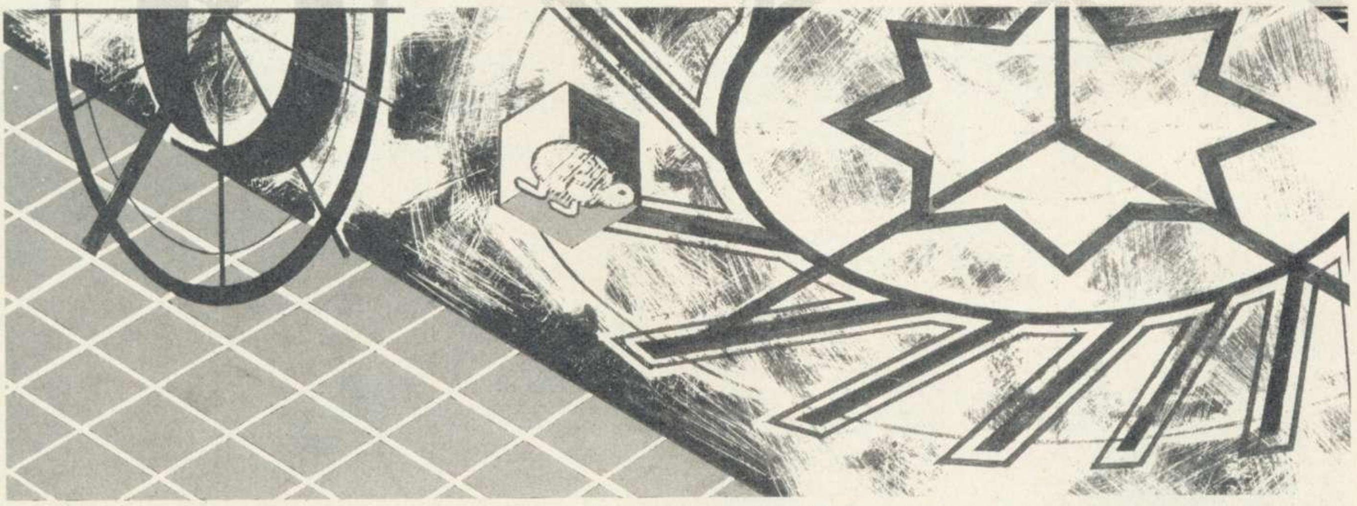
Logo was conceived as part of a philosophy rather than a language. As a philosophy it encompassed much of what we have already discussed, and

yet the initial impetus for the language was to provide a tool for mathematical investigation. Certainly commentators emphasise this aspect by showing how children use turtle graphics under Logo control to produce mind-boggling patterns or to draw houses.

There is a place for this sort of 'learning by discovery' but it is important for adults to differentiate between children drawing pretty pictures and children learning a new concept. Nevertheless, Logo's turtle graphics can support both extension and consolidation of children's geometrical and spatial awareness skills. This should prove a major advantage of a programming environment available both at school and at home.

The great proponent of Logo is Seymour Papert, and users interested in Logo should find his book *Mindstorms* interesting reading. Teachers might like to consider how the ideas could be implemented in English lessons.

Logo is, in fact, a collection of general-purpose facilities designed to support the learning process. For example, the mathematical commands for arithmetic and trigonometry are intended to encourage children to use numbers without fear, to explore very large numbers, very small numbers and patterns of numbers.



In many ways this aim must be now re-read with the advent of the electronic calculator, a far cheaper tool which some suggest tackles the same area of learning.

The value of Logo is that it has many facilities, and the mathematic operations are available for use not only alone, but with turtle graphics and also within the list processing area.

ILLUSTRATION: DAVID HOCKIN

List processing

Although Logo is normally introduced in the context of turtle graphics, the core of the language is its facility for list processing, which offers great potential for learning. Indeed, Logo is basically a list processing language. It takes lists of words, called objects, and processes them. The first list of words a person types at a Logo keyboard is likely to be:

```
FORWARD 100
```

and this list of two words is processed by Logo by taking the first part of the list and checking whether it is a 'primitive' word. A primitive is part of the Logo dictionary on switch-on. The word FORWARD is a recognised command, and Logo tries to process it and finds that the command needs an object to support it. This object must be a number. As we have supplied a number the whole command is obeyed and the turtle moves forward 100 units (turtle steps).

Not all primitives are commands. For example, the Logo primitive SENTENCE (called JOIN in some versions) requires two lists as inputs or objects but produces an output from itself. This output is a single list which combines the two input lists. Primitives that output a result are called 'operations'. All primitives will be commands or operations.

All objects must be either lists or words or numbers.

The following are all lists:

```
[HELLO CHEEKY HOW ARE YOU]
[SUN MON TUES WED THUR FRI SAT]
[MANN MATHEW 13 ACACIA AVE.
    CLEVERLAND]
[A E I U O]
```

It's possible to have lists inside lists, eg:

```
[ [MANN MATHEW] [13 ACACIA
   AVE.] CLEVERLAND]
```

has lists within a list. Readers used to data handling will see just how powerful it is to have a data record visually organised. Combine this with Logo's processing power and the creation of data handling programs could become the province of all.

Words are normally introduced by a quote mark. For example:

```
"Hello
"MON
"MANN
"13
"a
```

are all examples of words. It then becomes possible to handle these words and lists by using primitives. For example:

```
PRINT [Hello how are you?]
```

will print:

```
Hello how are you?
```

While:

```
PRINT "Hello
```

will print:

```
Hello
```

Typing:

```
PRINT "Hello "how "are "you
```

normally responds with:

```
Hello
```

followed by:

```
LOGO DOESN'T KNOW WHAT TO DO
  WITH how
```

Error messages occur whenever Logo meets something it cannot handle. In the case above, PRINT needs only one input – ie "Hello. Once:

```
PRINT "Hello
```

is processed the Logo interpreter tries to process "how. Because it cannot, it replies with an error message.

If we had wanted to print both 'Hello' and 'how' then we could have used:

```
PRINT [Hello how]
```

or we could have used another primitive operation:

```
PRINT SENTENCE "Hello "how
```

In some versions of Logo the primitive

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TRADE, ENQUIRE ABOUT NEW LINE

AS SEEN ON TV

SENTENCE is called a greedy primitive. Such a primitive can take more than two inputs if parentheses are used. For example:

PRINT (SENTENCE "Hello "how "are "you?)

results in

Hello how are you?

Variables

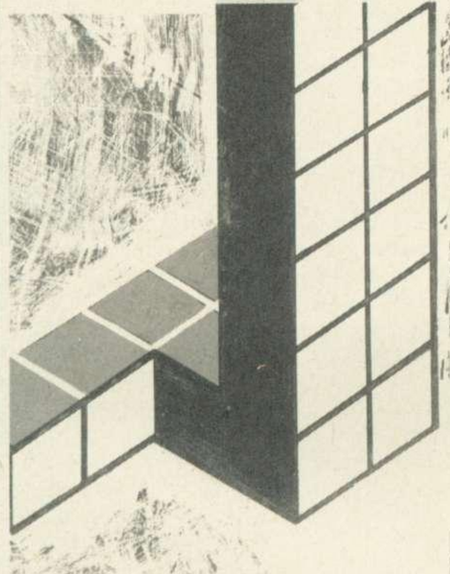
In BBC Basic we are used to long (and hence meaningful) variable names. Different kinds of variables have a different final character, such as $ for string data. In Logo, however, the only variable type is the object, and this is created using a MAKE command. For example:

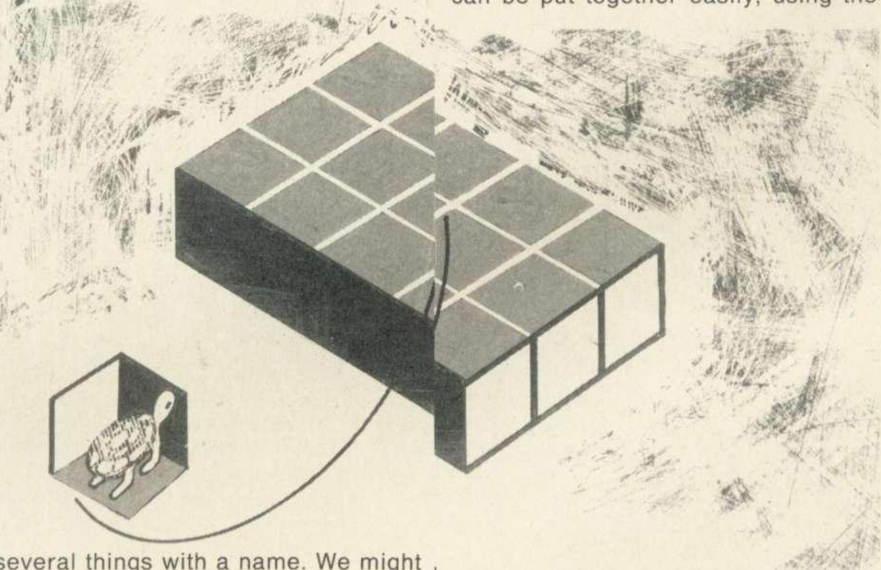
MAKE "Bill 835174

would create an object Bill and associate the number 835174 with it, while:

MAKE "Jim "GOLIGHTLY

would create an object Jim and associate the word GOLIGHTLY with it; and:





MAKE "Record1 [[ALAN EARL] GUITARZAN SOUTHBANK]

creates an object RECORD1 and associates a list with it. The quotation marks at the beginning of a word indicate it is a name. So typing:

PRINT "Jim

prints

Jim

To get at the item associated with Jim we normally type:

PRINT :Jim

which prints

GOLIGHTLY

One benefit of this approach is that words and numbers can be combined without changing data types. So it becomes possible to perform any operation on any object. If we:

MAKE "Phone1 427654
MAKE "Phone2 354223

then we can:

PRINT :Phone1 + :Phone2

to give 781877, which is arithmetic addition. Or we can:

PRINT SENTENCE FIRST :Phone1 BUTFIRST :Phone2

which gives 4 54223, and is a complex list manipulation. Or we can:

PRINT WORD FIRST :Phone1 BUTFIRST :Phone2

which gives 454223, and is a complex word manipulation. Notice that SENTENCE makes a list (because of the space between the 4 and the 5), while WORD makes a joined word.

Imagine we want to associate several things with a name. We might first type:

MAKE "Vanda "Famulok

but Logo lets us associate a further line of address with "Famulok by defining the thing associated with "Famulok. This is done by using:

MAKE "Famulok "Fountains.Meadow

or:

MAKE :Vanda "Fountains.Meadow

because: Vanda is the same as "Famulok. To get this information back we can type:

PRINT "Vanda PR :Vanda PR :Famulok

However, this means that we need to know what is associated with :Vanda, and in a large data file this might not be the case. Logo lets us use a device to get round this. We can type:

PRINT "Vanda PR :Vanda PR THING :Vanda

which says print Vanda; then print the thing associated with Vanda (:Vanda); then print the thing associated with the thing associated with Vanda (THING :Vanda). The resulting printout is:

Vanda
Famulok
Fountains.Meadow

This associativity can go on and on, so that:

MAKE THING THING THING :Vanda "Spennymoor

is quite acceptable.

Write your own dictionary

One of the most powerful ideas of Logo is that new primitives or procedures can be created and then used as if they had always been part of the Logo core. This facility is in effect the 'programming' part of Logo. As most procedures can be put together easily, using the words already defined, Logo always keeps the solution in view. Once a procedure is made it can be altered by editing it and re-tried. Using the method of hypothesis and building, followed by repeated testing and refining, children can check their own solutions to problems. Variables can also be used inside procedures, either globally or locally, or they can be sent to the procedure as parameters.

Let's use a problem to see the layout of lines in a Logo procedure:

'A secret agent receives this coded message: 77 69 69 84 65 84 84 72 69 82 69 68 80 73 71. His key is that 65 means the letter A. Can you help him decode the message?'

Because the message is a list of numbers the procedure we write must

ILLUSTRATION: DAVID HOCKIN

take this list as an input. The translation should be output, so the procedure we make will be a Logo operation. In Basic we would call it a function, because it returns a value. If we call it DECODE we will eventually type:

```
PRINT DECODE [77 69 69 84 65 84 84
    72 69 82 69 68 80 73 71]
```

Note that we need PRINT to display the result of the operation. The function can be considered as being sandwiched between start and finish lines:

```
TO DECODE :message
.....
.....
.....
END
```

The TO command starts the definition of DECODE, which is specified as needing one input parameter. The END line ends the definition (some Logos do not use this word, relying on a screen editor).

To decide on what goes in the sandwich we should consider a possible solution to the problem. Suggest using A as 65, B as 66 and so on and you discover that the ASCII code is in use. Now we need to write some code that will take a single number and return the character matching its ASCII value. Our first attempt might be:

```
TO DECODE :message
   OUTPUT CHAR FIRST :message
END
```

which returns the first item in the message list as a character – a good start but we need to keep doing this until all the numbers are used.

Our second attempt might be:

```
TO DECODE :message
OUTPUT SENTENCE CHAR FIRST
   :message DECODE BUTFIRST
   :message
END
```

This works by building up a sentence using recursion to decode the first element of a list, which is made smaller each time the function recurs. Unfortunately, the routine stops with an error message, which indicates that it cannot handle an empty list. To cope with this, we add a line:

```
TO DECODE :message
IF EMPTYQ :message [OUTPUT []]
OUTPUT SENTENCE CHAR FIRST
   :message DECODE BUTFIRST
   :message
END
```

which concludes the recursion when the question 'Is the message list empty?' meets with the answer 'Yes'. If we now type:

```
PRINT DECODE [77 69 69 84 65 84 84
    72 69 82 69 68 80 73 71]
```

we will get:

```
MEETATTHEREDPIG
```

Obviously, our secret agent might wish to generate his own code as well as receive it. This operation will allow such an activity:

```
TO ENCODE :message
IF EMPTYQ :message [OUTPUT []]
OUTPUT SENTENCE ASCII FIRST
   :message ENCODE BUTFIRST
   :message
END
```

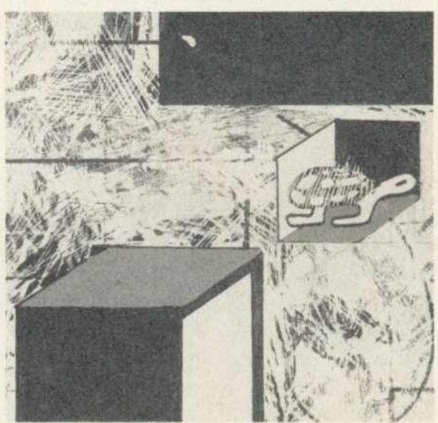
and typing:

```
PRINT ENCODE
   [MEETATTHEREDPIG]
```

will result in the original code:

```
776969846584847269826968807371
```

One of the great values of the Logo philosophy is that we don't expect children to work from zero in a particular



activity. Let's say that in a class of 11-year-olds, for example, we have two children who could write the operations shown above, eight who could alter them, and the remainder with whom the operations could be used. There is little point in trying to teach children to program if they are not at the appropriate developmental stage, but for those who are altering the operations to start encoding and decoding from any particular number would prove useful. There is much value in children working with the operations to encode and decode secret messages, providing it fits into the scheme of work on which the children are currently engaged.

At home of course, such 'restrictions' will not exist, and children can move between widely different ideas as the mood takes them.

Microworlds

If children use a Logo procedure that has been written as a tool for them to explore some concept or to practise some skill we say they are working within a 'microworld'. In educational terms there should be several Logo environments, each of which should be capable of supporting a number of microworlds. A good Logo should support: 1. A maths environment; 2. A geometrical and spatial environment; 3. A general topic-based learning environment; 4. A language (English) environment; 5. An information handling environment; 6. A musical/sound exploration environment and 7. A control environment.

At present I think it possible to use Logo without much difficulty in the first two areas. Once educators become aware of the power of the Logo list processing facilities, items 3 and 4 can be tackled by microworld-based Logo tools. It seems that Logo may provide a low-cost alternative to all but a few of the expensive CAL programs currently available for schools.

Follow the turtle

It has been said that turtle graphics were added to Logo as an afterthought. If that is the case, their obvious popularity and ease of use should encourage the creators of Logo to consider similar interfaces to other areas of learning. The last three items of the above list really depend on the facilities of Logo rather than the toolmaking skill of a teacher. At present few Logos support proper file handling. All BBC Logos repeat the SOUND and ENVELOPE statements, which are unsatisfactory for most musicians, and the tools for control and monitoring return to the simple PEEK and POKE of earlier computers (with the exception that ADVAL is supported).

These problems are not found only with BBC Logos; they exist across the whole range of Logo, diminishing a very good language for learning. Perhaps the solution is a number of purpose-built extensions that will handle the areas of information handling, sound and control. In addition, some way of simplifying the methods of list processing would be useful. Already in Cleveland we are evaluating Logo-like interpreters (written in Basic) that examine sound from the viewpoint of learning about music and composition, and controlling equipment by using English sentence-based commands such as TURN THE BUZZER OFF and IF THE LIGHT-SENSOR IS DARK THEN TURN THE LAMP ON.

It would be much easier if these dialogues could be extensions to Logo rather than being written in Basic. Adding them as tools written in Logo seems generally unsatisfactory because of the slowness of the language, and because some facilities do not exist.

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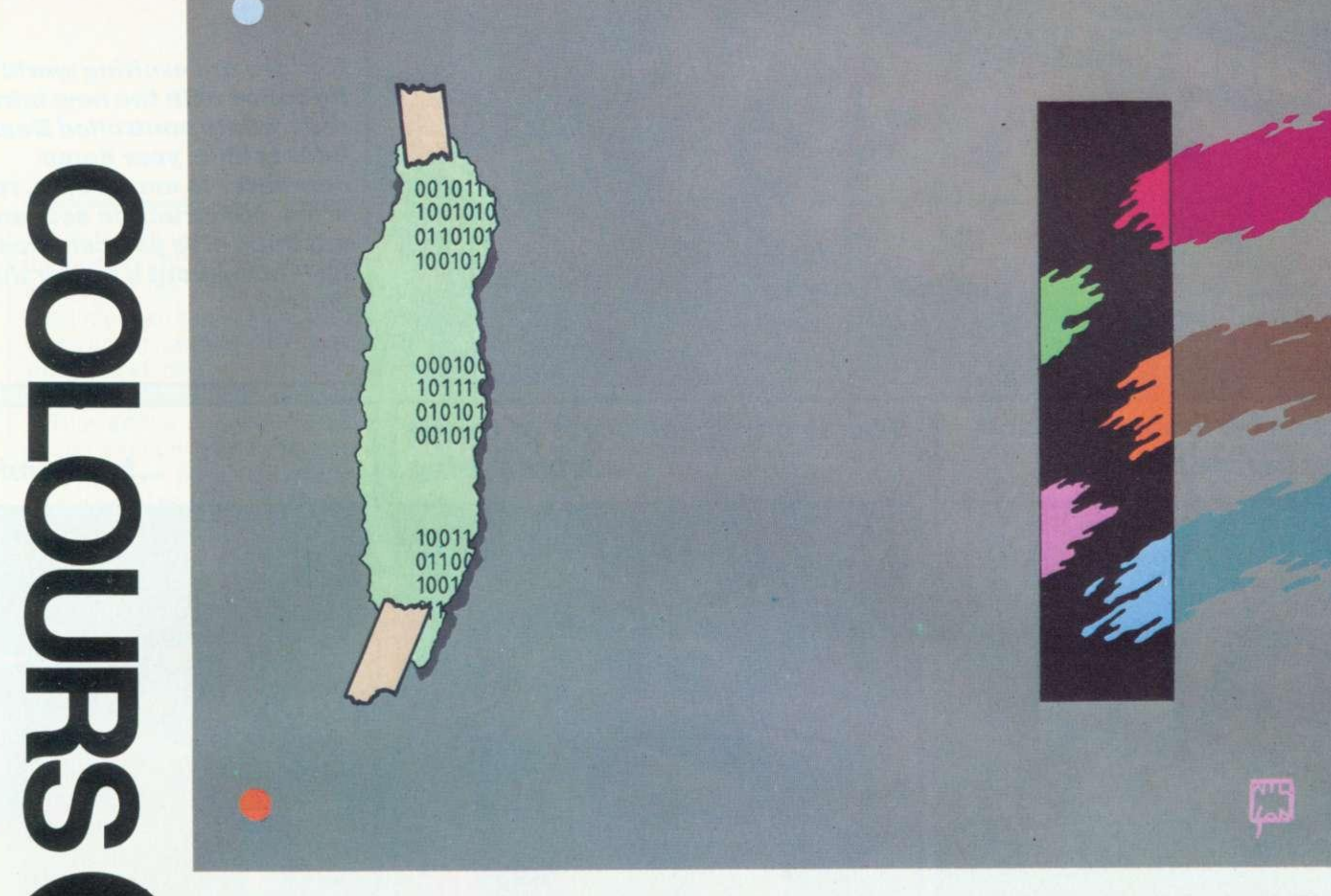
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COLOURS BY INTERRUPTS



You'd like high-res, multi-colour graphics without losing too much memory? Tristram Mabbs shows you how

ONE OF the more popular features of the BBC micro is its ability to have an abundance of colours present on the screen at once. This is accomplished in a relatively simple way by having a display which requires a number of bits for each pixel, and the binary number contained within these bits determines the colour. This leads to screen modes with a large number of colours which require an even larger number of bits and so you get either reduced resolution or a large amount of program memory disappearing out of your reach.

Other manufacturers have managed to overcome this, so why shouldn't the BBC micro have high resolution, multi-colour graphics with plenty of memory left too? The answer is that for a sophisticated machine like the Beeb, the methods used to achieve this, additional memory or colour attributes, are generally unacceptable.

Additional memory is usually found in one of two forms. First, as screen memory RAM overlays, eg Aries B20, Raven and Watford Electronics 32k RAM boards. Another example is, of course, a second processor.

Second, memory is removed from the processor's reach and accessed either as paged memory (like the BBC micro's ROMs) or through a few locations by giving commands to the video display hardware. The method used to program the 6845 is an example of a more complex version of this.

The second common method of obtaining large numbers of colours has fewer variations. All graphics are accessed in a similar manner to the teletext graphics found on the BBC micro's mode 7 – that is, a byte precedes the graphics and defines their colour. This has the obvious disadvantage of requiring bytes to define the colour and no pixels can appear in such bytes.

There is, however, another method which is rarely used. It is implemented very successfully on the Atari range of computers and involves redefining colour registers *during* a scan of the screen as a result of an interrupt. Atari have christened this technique the Display List Interrupt (DLI). It may sound rather complex but application is relatively simple.

This method has disadvantages, but can be implemented on any BBC micro without additional hardware and as such is very useful in commercial software, and the basic idea can be expanded in various ways, which I'll describe. The disadvantages themselves are largely a matter of inconvenience – you cannot redefine a colour cleanly while it is being displayed, and the processor interrupt overhead is slightly increased. The results, however, show that the advantages far outweigh the disadvantages.

There are two techniques to carry this out on the BBC, but only one is described in detail here. The other can only be used if no other interrupts are occurring and the screen is in mode 2; but why bother with this technique if you can afford the memory overhead for mode 2 anyway?

The first method involves trapping two of the BBC micro's housekeeping interrupts – the interrupt to indicate that the screen is being updated and all the top of screen conditions now apply, and the timer interrupt which tells the microprocessor that it needs to change a colour now.

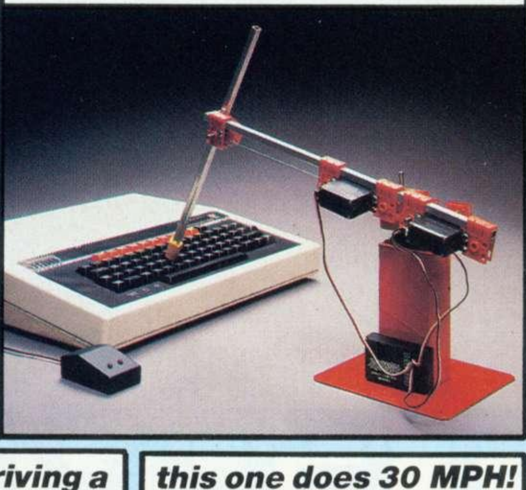
What happens is that the timer is set at the top of the screen (and after any subsequent interrupt if several changes are required) so that at any



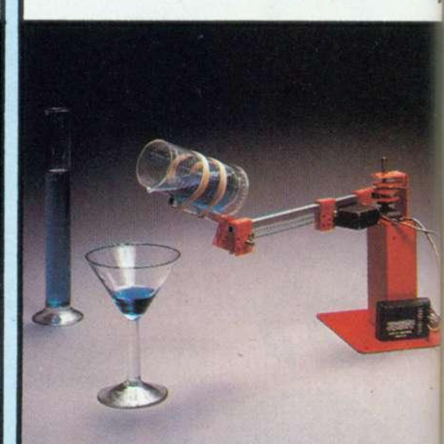
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point, the value in the timer indicates the position of the electron beam as it traces out the picture on the display. The timer can cause an interrupt after a given count has been reached and thus when the electron beam is at a specific point on the screen.

This article and the follow-on next month explain how to implement this technique on the BBC, first to change colours and next month expanding this to split the screen into several different modes.

Electron users, please note that due to the use of the spare system via timer in the Beeb, this software will not work on your machines . . . yet.

Before going any further, I'll explain the video ULA as it has to be directly accessed by the software rather than using calls such as VDU19. As a point of interest, I discovered the method of operation of the ULA by connecting the ULA chip select to the microprocessor NMI (Non Maskable Interrupt) line so that, whenever the operating system accessed the ULA, an interrupt occurred and a short routine saved the registers.

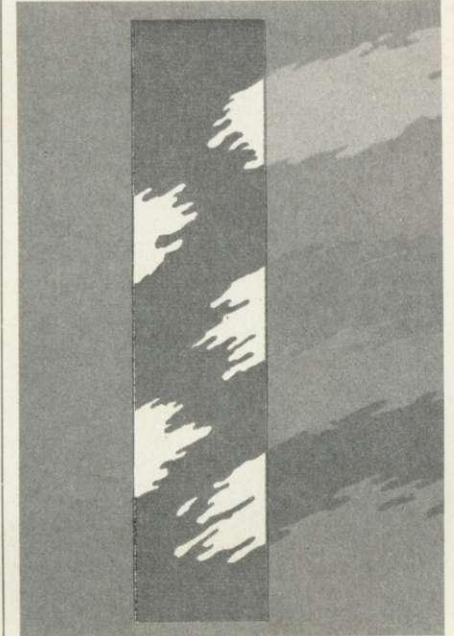
The ULA consists of two registers, a control register and a palette register located at &FE20 and &FE21 respectively, and I'll explain the control register next month. The palette register consists of 16 four-bit write-only locations. Each location is written-to by placing the data on the lower four bits of a byte where the top four bits contain the address. Thus writing a value of &0x to &FE21 will write to the first location, &1x the second and so on. The lower four bits contain the physical colour Exclusive ORed with 7.

The function of each of these locations depends on the currently selected screen mode. For mode 2, each location corresponds to the appropriate logical colour. Thus writing &00 to location &FE21 will define the background colour (colour 0) as logical colour 7 (remember the physical colour is Exclusive ORed with 7). Two-colour modes are also relatively simple. Here, eight locations must be set for each colour: locations 0 to 7 determine colour 0, and 8 to &F determine colour 1. Note that not setting each group of eight locations to the same value can cause some interesting effects.

Finally, for four colour modes, the relationship between colours and locations is more complex. Four locations must be set for each colour but these are not grouped together as for two-colour modes; colour 0 is controlled by locations &0x, &1x, &4x and &5x, colour 1 by &2x, &3x, &6x, and &7x, colour 2 by &8x, &9x, &Cx and &Dx and colour 3 by &Ax, &Bx, &Ex and &Fx.

This brings us to the program, which is in the form of a procedure that can be used in Basic, or the machine code may easily be used by itself. A short (15 line) routine is patched onto the beginning of the program to form a demonstration of the procedure and to illustrate its use.

PROCsetdlis requires one parameter in the form of the start address of a block of data in memory which contains a series of three byte entries arranged as follows. Bytes zero and one contain a value to be written into the VIA timer thus determining when the next DLI will occur. Byte two is split into two nibbles, the upper four bits selecting which colour is to be changed (colour 1 in the example, hence the OR&10 in line 50; colour 2 would be &20 and so on) and the lower four providing the colour it is to be changed to. This



colour does not need to be Exclusive ORed with 7. This table of entries is terminated by an entry with all three bytes set to &FF. Please note that the final DLI *must* occur before the bottom of the screen to prevent spurious interrupts being generated. The demonstration routine simply sets the data up so that coloured bands will be produced spanning four lines in colour 1, mode 6. Note that Line_Val is only &260 for modes 6 and 3, ie those with 25 lines of text. Selecting a mode with 32 lines will cause the bands to cover approximately five lines.

The main procedure is largely self-explanatory if you are familiar with machine code and understand the information above. There is a common section from line 10000 to 10480, followed by a series of routines, one of which is selected by line 10340 depending on the current screen mode (as found at line 10010). If you wish to shorten the routine and tailor it to a specific application, you can use only the routine appropriate to the particular mode you will be using and delete the others; the selected routine should be inserted from line 10340 to 10349.

A point to note is that the first DLI timer value has &1AB added to it by lines 10050 and 10060 to allow for the blank area at the top of the screen. This value is valid for *TV. Using *TV to shift the screen has no effect on the DLI routine as the DLIs are referenced from the frame sync, not the first line of screen data. Therefore, using *TV shifts the display relative to the DLI changes.

Finally, there are two other routines appended to the program, PROCdlisoff and PROCdlison. These allow the interrupts to be deselected and reselected from within a program if the program needs to extend the DLI data. Note that the DLI data is portable between modes with the same number of colours, though take into account the difference between 25 and 32 line modes.

There are a couple of general points to remember. First, you may notice slight flicker when running the program, caused by the DLI interrupts not having priority over the operating system. To cure this totally, a re-entrant DLI and operating system interrupt routine is required. While this is possible, it makes the software operating system dependent as calls have to be made into the OS ROM itself rather than through the vectored calls in page &FF. Advanced programmers may like to reduce the problem by disabling interrupts they are not using, thereby minimising the chance of conflict. The flicker becomes increasingly pronounced as more DLIs are added and the chance of interrupts clashing increases, so select your screen layout with care.

Next, it is best to arrange for a DLI to change a colour that is not currently being displayed, as this way the flicker caused by all the registers failing to change at once does not appear on the screen.

Finally, if you are running very short of memory, use CLEAR to remove all the variables after using PROCsetdlis, then re-dimension the two arrays—the one containing the DLI data and the one containing the machine code; the length of the latter array is given by FNassemble (0,&D000)—as they will then cover the same area of memory as the original arrays which will be preserved, but all other variables will have been deleted.

Tristram Mabbs listing and instructions on entering the program are on yellow page 101

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WATCH YOUR SCREEN FOR A GOOD PLOT

Nigel Jennings' *Graph* program allows you to plot equations on screen

A PROGRAM to plot equations so you can check your maths homework and impress your teacher – and any particularly artistic results can be dumped. The basic idea behind *Graph* is to represent a sheet of graph paper on the screen. The program will accurately plot any sensible mathematical function in the cartesian plane. By convention, Y is evaluated on the vertical axis as a function of X along the horizontal.

The program provides various functions and controls over output format. Considerable precision is achieved in mode 0, although this requires 32k, and the use of a monitor is recommended for readability. However, a mode 7 Help screen can be accessed at any time.

I have defined the plotting area so that, in the default mode, both axes are drawn from −10 to +10 (20 units in length). The BBC micro's graphics screen of 1280×1024 pixels can be conveniently 'rounded' to 1200×1000, providing essential margins at the screen boundaries. A one-line text window is required at the bottom of the screen for display of input and format code. Mode 0 accommodates 32 lines of text, which means that mode 0 text is 1024 divided by 32 pixels high, ie 32 pixels, leaving a maximum available Y-axis length, including the two borders, of 968 pixels (1000−32).

To ensure plotting accuracy, it is desirable to maintain an X:Y scaling that can be represented exactly by the computer. This is readily achieved with the X-axis, where 1200/20=60. Reducing the Y-axis length slightly gives 960−20=48, so we have a plotting ratio of 60:48, or an intrinsic scaling Y=0.8X – this is a measure of how much the Y-axis is 'compressed' compared with the X-axis. By coincidence we now have exactly 32 pixels spare in the Y-direction (1024−960−32), and so can have equal margins of 16 at top and bottom. The X-axis margins work out conveniently at 40 on each side.

As the axis origin will be variable it is sensible to relocate the graphics origin with a VDU 29 call; the default X-co-ordinate is given by 40+1200/2=640 and the Y-co-ordinate by (32+16)+960/2=528.

Figure 1 (not to scale) illustrates the above arrangement.

Addressing the screen

To enable the axis origin to be changed during execution of the program, the screen is addressed by reference to the current graphics origin co-ordinates, relative to the margins. The significant points of each axis have the relative co-ordinates shown in figure 2.

It can be seen that when the axis origin (XA%,YA%) has the default co-ordinates of 640,528, the X-axis is plotted from screen positions −600 to +600; the Y-axis is plotted from −480 to +480.

The scale factor can also be changed during program execution, but plotting calculations must take account of both the 60:48 scaling and the current scale factor (SF).

For evaluation of the function to be plotted, all values must be scaled up to 'real-life' magnitude. X-values are incremented by the program statement:

```
FOR X=(40−XA%)/60/SF TO
    (1240−XA%)/60/SF STEP 0.1/SF
```

Irrespective of the axis origin of the scale factor, this expression always produces 200 X-values (actually, certain scale factors produce one extra X-value). At the default scale factor of 1, the values range from −10 to +10. If the scale factor is increased to 2 then the X-values range from −5 to +5. X-values are plotted at a density of six pixels per point (1200/200).

When the function has been evaluated for each X-value to produce a corresponding Y-value, it is necessary to scale down again to the magnitude required to plot each X-Y co-ordinate on the graphics screen. This is achieved by multiplying the X-value by 60×SF and the Y-value by 48×SF.

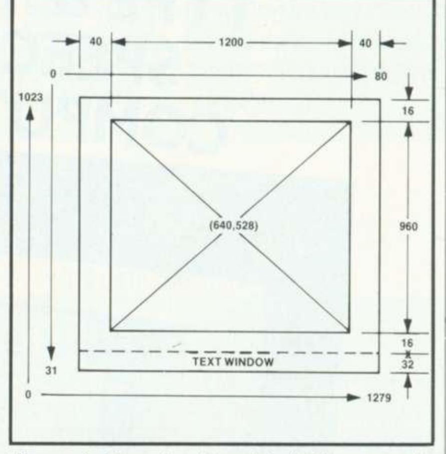


Figure 1. How the 'Graph' plotting area is defined, with margins all round and a one-line text window to display input and format codes

A similar process is used to calculate and print the scale points along each axis. Here the expression for the X-axis is incremented in steps of 120 and the Y-axis in steps of 96 to produce graduations and scale points at 20 intervals on each axis. Again, the scale points are calculated with reference to the scale factor and the 60:48 scaling. Whatever the scale factor, though, exactly 20 intervals are always graduated on each axis; only the values assigned to each graduation change according to the scale factor and axis origin.

This symmetry has one drawback, overcome by the procedure that

prompts for and executes new axis origin co-ordinates. PROC_ORIGIN contains a pair of functions that round up each new co-ordinate input to the nearest value that will produce scale points of even magnitude about the axis origin. Otherwise the untidy situation can arise where arbitrary X and Y co-ordinates will not intersect exactly at zero, because the graduations are 'fixed' on each axis. The alternative but more involved approach is to calculate variable graduations.

It is confusing but purely coincidental, by the way, that the margin relative to which the Y-axis is addressed and its intrinsic scaling are both 48.

Control codes

Output format and program functions are controlled by a series of codes that can be entered whenever the computer prompts for input. There are two types of code: print control codes select presentational features, operating with on/off logic. The currently selected print control codes are displayed on program initialisation whenever a code is changed or when the user requests. Program control codes determine changes to the normal execution of the program and have immediate effect. The effect of each code is shown in the box on page 85.

The program needs to distinguish control codes from potential functions for plotting. It achieves this by placing all the code mnemonics (except the Help and Repeat codes, which need separate attention) in an array, Code$. All input is tested against this array and, if a correspondence is found, the control code is executed appropriately. The status (true or false) of the print control codes is recorded by another array, Code%. The structures of Code$, and Code% at default, are shown in figure 3.

Error handling

The scope of the program is greatly increased by specifically handling four errors that a wide class of functions will create. These manifest themselves as the computer errors 'Division by Zero', 'Too Big', 'Negative Root' and 'Log Range'. Examples are, respectively, 1/X, 1/X with SF = 5, SQR(X), and X↑1.5. Such errors arise in PROC_PLOT, while attempting to evaluate and plot the expression, for some particular value or interval of X.

All error-handling is contained in PROC_ERROR, which suitably increases the current X-value and then re-calls PROC_PLOT with new parameters. Certain complicated functions may cause this process to be repeated several times in succession before uninterrupted plotting resumes. Other 'treatments' are possible and worth considering if the user has problems with some exotic function he wishes to plot. PROC_ERROR also traps Escape and syntax errors in input.

Remaining errors will have one of two effects: the computer may 'recognise' that it is unable to plot the function, and return direct to the input prompt, or it may fail to plot the function correctly and produce garbage (often in the form of closely packed vertical lines) – a change of scale factor or origin may help here.

GOTO has been completely eliminated by the statement

```
ON ERROR PROC_ERROR
```

After error-handling, execution continues from the statement immediately following the ON ERROR statement, which here is the main program Repeat loop.

One remaining problem arises when plotting with a solid plot line functions containing Tan X. Tan is evaluated as an internal function which contrives to 'ignore' those values for which it is not defined (recall TanX = SinX/CosX). As a consequence, the 'jumps' are traced out by the plot line. If you are desperate, the following unwieldy statement will cure the problem:

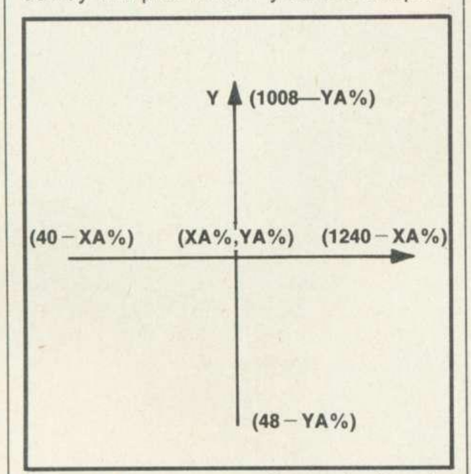


Figure 2. Relative co-ordinates for the significant points of each axis

```
8050 IF NOT Code%(6) AND
     INSTR(A$,"TAN") AND
     ABS(Y) > 5/SF AND
     SGN(Y) < > SGN(Yvalues
     (I% = 1)) PLOT
     4,X*60*SF,48 – YA%
```

An example of 'other treatments'!

Program structure

A few other points are worth looking at with regard to the program listing. The string variables A$, which holds the current input, and B$, which holds a copy of the last function plotted, are each assigned with an over-generous 78 blank spaces at lines 700:800. As many readers will know, considerable memory space can be saved by first assigning strings to their maximum likely length (if the actual length is going to vary).

INKEY$ timers are used to provide maximum display periods for the Help screen and print control codes display of approximately eight and five seconds respectively. A quick tap of any key will resume program execution immediately. The delay duration is easily changed – the argument to INKEY$ is centiseconds.

The program resolves to a short loop calling the principal procedures. This structure facilitates error handling, as we have seen, and allows mode changes in conjunction with PROC_HELP (mode cannot be changed from within a procedure). Following convention, the axes are drawn before the graph is plotted, but for clarity the scales are drawn afterwards.

ENDPROC is frequently used to force a premature exit from procedures. Whether this is good programming practice is perhaps debatable, but it gives a minor speed advantage and simplifies program structure. On that note, ELSE is used infrequently because BBC Basic does not possess a structured IF . . . THEN . . . ELSE . . . ENDIF construct and one-line IF . . . ELSE statements can become tiresomely long: two exclusive IF statements are probably executed just as quickly.

In PROC_INITIALISE, VDU 29 relocates the graphics origin and VDU 28 defines the text window: for a one-line window the bottom-Y and top-Y parameters are identical. A graphics window is not defined; the only place that graphics plot outside the defined area is in the text window, where they are 'wiped out' by scrolling (for which reason the function string must be re-printed after input).

PROC_PLOT is responsible for the principal function – plotting the graph. If a solid plot line is selected it is important to position the graphics cursor at the exact starting point of the graph, otherwise a spurious straight line will trace the cursor's path from the last point plotted (usually the top of the Y-axis). The function to be plotted is evaluated for each X-value by the powerful EVAL(A$) statement. A 201-element array, Yvalues, holds the value of the plotted function for each X-value, and is used for the Superposition function.

PROC_SCALE calculates the positioning of the scale points that are printed at the graphics cursor using VDU 5. The scales are formatted using @% = &02010A, where 02 is fixed format, 01 is one decimal place and 0A is field width of 10. VDU 4 and @% =

&0A cancel these settings at the procedure end.

As the procedure visits every scale point on the axes it is more efficient at drawing the graduations than PROC_AXES. Because the scale points are symmetrically placed against each graduation, the end points overhang the axes by half a character. Hence the need for the margins around the plotting area, the Y-axis fortuitously having a margin of exactly half the height of a mode 0 character.

PROC_ORIGIN, which handles new axis origin co-ordinates, arbitrarily restricts the range of those co-ordinates as a minor input validation measure. If you wish to plot outside that range the condition can be removed. With practice, one or both axes can be retained on-screen for scale reference; using Overprint (OP), plot Y=0 to print the required axis scale correctly aligned while the other is positioned off-screen, then relocate the other axis and plot the desired function.

Full provision has been made in the program for a screen dump to printer routine which can be called using the code mnemonic SD. All the user need do is write the dump procedure or interface into PROC_DUMP.

Other developments to consider are separate scale factors for the X- and Y-axes, and graph labelling (perhaps using a drag routine with the cursor control keys).

1	2	3	4	5	6	7	8	9	10	11
Code$ (11)										
"AO"	"SF"	"AX"	"AS"	"PL"	"OP"	"SP"	"SD"	"RS"	"C"	"E"
Code% (8)										
– –	– –	−1	−1	−1	0	0	0			

Figure 3. The structure of the arrays Code$ and Code% (at default)

Testing the program

When the input prompt 'Y = ' appears in the text window, you can enter either a mathematical function, which will be plotted, or a control code, which will be actioned. Unless you are familiar with the function, it is best to start plotting with the default origin and scale factor. An area of interest in the graph can then be examined more closely by increasing the scale factors and possibly moving the origin. Use RP to repeat the last function plotted. Compare different graphs using OP and PL.

Expressions such as Y=X, Y=X↑2, Y=X↑3, and combinations such as Y=X ↑ 3+4*X ↑ 2−3 (with SF=2) will produce classic polynomial graphs. For example, Y=5 will plot a horizontal line.

To see how Superposition (SP) works, test the equivalence of say Y=X+COS(X) and Y=X followed by SP then Y=COS(X); or Y=4*COS(X) and Y=COS(X) followed by SP then RP, RP, RP.

The following expressions are pretty severe and will test error-handling:

$$\frac{1}{(X+1)}+1 \qquad \frac{(X+2)}{(X-1)*(X-3)}$$

Bear in mind operator precedence when entering them: 1/(X+1)+1 and (X+2)/((X−1)*(X−3)) are correct forms.

Try expressions involving the built-in functions ABS, INT, DIV, MOD, LOG, EXP, SQR and the trig functions.

You may find it useful to program the user-defined keys to have '+', '*', '(',')' available without having to press Shift, functions such as 'COS' and 'SIN', or even selected control codes.

CONTROL CODES

PRINT CONTROL CODES

AO: Axis Origin
Inputting 'AO' prompts for new co-ordinates of the axis origin. The co-ordinates are adjusted to the nearest points convenient for plotting purposes. The default co-ordinates are 640,528. The program will accept X from 0 to 1279 and Y from 0 to 1023.

SF: Scale Factor
SF prompts for a new scale factor. The default is 1 when both axes are plotted from −10 to +10. For convenience, SF is really an inverse factor and SF=2 plots from −5 to +5 while SF=0.5 plots from −20 to +20.

AX: Axes
AX switches the axes 'off' and plots further graphs on a blank screen until 'AX' is input again.

AS: Axis Scales
AS stops printing of the axis scale points, while graduations continue to be drawn, until AS is input again. Note that AX also switches off the scales. AS is quite useful when the graph overlays the scale points.

PL: Solid/Dotted Plot Line
PL interchanges between a dotted and solid plot line – the default dotted line is usually more aesthetically pleasing, smoothing out rough edges, but it is particularly useful to employ the solid line when comparing different graphs after OP (see below). Note that for functions that are not 'well-behaved' a solid plot line may give a misleading impression of continuity in the graph which does not really exist, whereas a dotted line hides the discontinuities.

OP: Overprint
Selecting OP retains the previous graph(s) on screen during all subsequent plots. Deselecting OP ensures the screen is cleared before each new plot. OP in conjunction with a change of axis origin or scale factor is not prohibited, but beware – the results may be unpredictable.

SP: Superposition
Superposition effectively means adding two or more equations and plotting the sum. It is particularly useful in Fourier analysis where output can be modelled as the sum of various functions. SP will produce the summation of the last graph and the next function input. Again, SP is not an illegal combination after other format changes. Remember to switch SP off after use.

SD: Screen Dump (optional)
SD calls a screen dump to printer routine of the user's choice.

PROGRAM CONTROL CODES

RP: Repeat last plot
RP repeats the last function plotted – very useful if the scale factor or axis origin needs to be adjusted after first plotting a function. Note that unintentional use of RP and SP will cause unexpected (but sometimes elegant!) results.

RS: Reset
RS resets all print control codes to their default values. RP is still effective after using this code.

H: Help
Displays the control code descriptions in mode 7 without disturbing the selected codes. The display will clear automatically after eight seconds, or immediately any key is pressed.

C: Codes
Displays the currently selected print control codes at the text window; the display will clear after five seconds or on pressing any key.

F: End
Ends the program in a logical manner after normalising VDU parameters.

Nigel Jennings' *Graph* listing to allow you to plot equations on the screen by inputting the co-ordinates is on yellow pages 102-103.

MOVE • OVER FOR • BUDGE

Brian Lienard's graphics editor brings DIY icons to your micro

DO YOU use the user-definable graphics feature on your BBC micro or Electron? Have you ever wished there was an easier way of defining graphics characters than the laborious and error-prone method of counting powers of two for each cell, as described in the *User Guide*? Would you like to be able to see more clearly what your characters will look like? Do you need to define multiple blocks of characters to make bigger shapes? If the answer is yes to more than two of these questions then this program is for you.

There are lots of character graphics editors around, so what's so special about this one? *Budge* (BBC User-Defined Graphics Editor) lets you design and edit graphics characters on a larger-than-life grid five character 'tiles' wide by three high. You can move a cursor around this grid using the cursor control keys, to 'draw' your designs. Also, this program lets you see what your characters will look like when displayed real-size as you work on them. When you have finished, the program will automatically convert the design into complete VDU23 statements which are then easily merged with your own program.

The program has been tested on BBC OS versions 0.1, 1.0 and 1.2 and will also run on the Electron. The program uses mode 4 so you will see what your characters look like in 40-column mode. You will have to stretch or contract them mentally if you want to use them in 20 or 80 column modes.

Starting the program

The program first asks you four questions, as follows:

No. of chars. across (1–5, default = 1)?

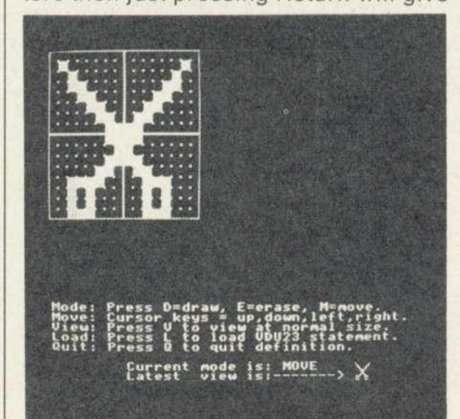
Answer with a number between one and five representing the number of character tiles you want across the screen. Just pressing Return sets the default value of one.

No. of chars. down (1–3, default = 1)?

Type in a number between one and three. Conceptually, the block of character tiles can be thought of as a single 5 × 3 shape, or several smaller shapes. You can, of course, treat each tile as a separate character, in which case *Budge* will let you define up to 15 of them in one run.

ASCII codes for chars. to start at (224-2XX, default = 224)?

where the value of XX will depend upon the values given in answer to the first two questions. The BBC and Electron micros let you define ASCII codes 224 to 255. You must say at this point which character numbers you want to define. If you have no other graphics characters then just pressing Return will give you the default of 224 onwards.



Scissors icon designed using Budge

1st line no. for VDU23 statements (1-32000, default = 1010)?

Graphics characters are defined by means of statements of the form:

lineNo VDU23,charNo,a,b,c,d,e,f,g,h

You need to tell *Budge* which line numbers you want to use for these statements. They will run in steps of 10 from the value you specify. They should not clash with any lines you are using for other bits of your program. I always have a procedure called 'init' starting at line 1000 which is called from any early line number in my programs: hence the default value of 1010 if you just press Return.

Defining graphics shapes

Once all the questions have been answered the screen is cleared and the set of tiles is displayed. Each tile is split up into an 8 × 8 array of cells representing the individual dots of a graphics character. Below the tile display the single key commands now in effect are summarised.

In the top left-hand corner you will see the cursor winking. You can move this cursor around the tile array by using the four cursor control keys in the top right-hand corner of the keyboard. These are the keys you normally use for editing programs.

What happens when you press the cursor keys depends to some extent on the mode that the program is currently in. Initially, the mode is set to 'move', and moving the cursor around does nothing to the display. By pressing D you set the mode to 'draw'. Moving the cursor now leaves a trail of white blocks in cells through which it passes. You can, of course, hold down the cursor keys to gain speed from the auto-repeat feature. You can't shoot off the edge because *Budge* will beep if you try to move outside the tile array.

The third mode is called 'erase' and is obtained by pressing E. In erase mode any white blocks in cells through which the cursor travels are wiped out. If you want to move to a different place without erasing or drawing blocks you can press M to set the mode back to 'move'. The mode change commands, D, E and M, can be given at any time between cursor movements.

Viewing your work

Pressing V, for View, at any time during the definition phase causes processing of the current tile display. You will see the cursor moving through the tiles of the display. *Budge* is constructing VDU23 statements for each tile. When processing is complete a real-sized copy of the tile display will appear in the bottom right-hand corner of the screen. This is useful because often shapes that look all right as a large block pattern look wrong when printed

the correct size.

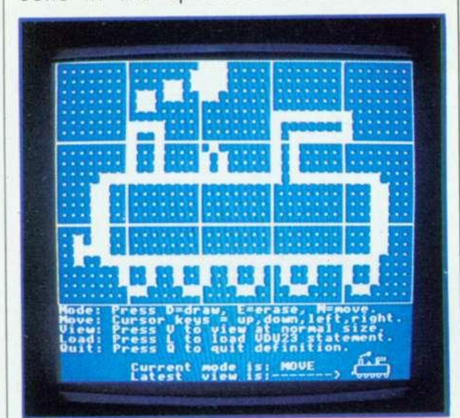
When the real-sized display has appeared you are invited to press any key to continue. Doing this returns you to the command summary but does not delete the real-sized display. The mode is always set to 'move' when you return, irrespective of which mode was active when you pressed V. The cursor will, however, be wherever you left it. At this point you can add to or modify the display as usual. The real-sized version will not be updated, however, until you press V again.

The Load command

Pressing L at any time lets you load a VDU23 statement into the tile display. Use this option if you already have some parts or all of a shape defined as VDU23 statements and you want to modify it. When you press L the command summary disappears and is replaced by:

LOAD: Which tile across (1-X/1)?

where X will be between one and five depending on the width of your tile display. Type a number between one and X and press Return. On the next line you are asked a similar question for the vertical position of the tile you want to replace. When you have done this, any cells in the specified tile which are



The 5 × 3 grid is adaptable

occupied by white blocks will be cleared, and below you will see:

Type in values from VDU23 statement:
Dot value for row 1 (0–255/0)?

You must now type in the first of the eight numbers following the character number in the VDU23 statement. If this statement was

VDU23,224,1,3,7,15,31,63,127,255

you would type 1 and press Return. The block pattern for the first row, corresponding to the number you have typed, will appear at the appropriate place on the tile display. Type in the remaining seven numbers to complete the definition of the tile. After the eighth number the command summary will replace the loading instructions again. The cursor will be where you left it when you pressed L and the mode will be set to 'move'.

VARIABLES

A%	loop index for X-co-ordinates
B%	loop index for Y-co-ordinates
C%	char. sequence no. (0–14)
D%	bottom limit of title display (7,15 or 23)
E%	offset for screen value
F%	flag used in PROCerase
G%	flag, G% = 0 View command, G% = 1 Quit command
H%	height of tile display (1–3)
I%	loop index over rows within tile
J%	loop index over cells within row
K%	saved value of X% (cursor co-ord.)
L%	left limit of tile display (always 0)
M%	mode: 1 = erase, 2 = draw, 3 = move
N%	dot value for row, used in Load command
O%	saved value of Y% (cursor co-ord.)
P%	X-co-ord. of tile origin (0, 8, 16, 24 or 32)
Q%	Y-co-ord. of tile origin (0, 8 or 16)
R%	right limit of tile display (7, 15, 23, 31 or 39)
S%	sum of V%s for current row (0-255)
T%	top of tile display (always 0)
U%	ASCII char. no. for 1st user-defined char.
V%	row cell value (128, 64, 32, 16, 8, 4, 2 or 1)
W%	width of tile display (1–5)
X%	current screen X-co-ordinate
Y%	current screen Y-co-ordinate
Z%	ASCII code of command key pressed
CHAN	Channel no. for data file
LI	line number for 1st VDU23 statement
vdu$(14)	string array for VDU23 statements
val%(14.8)	dot row values (used to make View display)

Finishing off

When you have finished drawing (and perhaps redrawing) your shape(s), you press Q to quit the definition phase. Make sure you really have finished because you cannot go back to change the tile display once Q has been pressed. It does not matter which mode you are in or where the cursor is when you do this. You will see the command summary disappear, to be replaced by the word PROCESSING. Above, you will see the cursor rapidly scanning through each character tile. Wherever there is a white block it is replaced by a # sign. There is no significance in this – it's just done to keep you informed of progress.

As each tile is processed the ASCII code for the character is printed in the top left-hand part of the tile. Once the processing is complete the program waits until you press any key before continuing. At this point it is a good idea to write down the ASCII character numbers and a description of them for future reference.

When any key is pressed, the program asks whether you want to save your VDU23 statements in a file or have them printed on the screen. Pressing F for file results in a file name being requested. Once given, the VDU23 statements are written as an ASCII file so you can merge them with your program by first loading it into memory and then typing *EXEC filename.

If you press S for screen then the VDU23 statements will be listed on the screen. At this point, these program lines are not stored in the computer's memory. To merge them with your own program, load it into memory and then 'cursor over' all the statements using the cursor and Copy keys just as if you were editing – but without making any changes in the lines. The screen display is more convenient if you do not have disc drives.

Program details

It's not necessary to understand how the program works in order to make good use of it. However, for those who would like to know how it's done, you'll find a brief description of all the variables in the table above and some notes on the listing on the yellow pages.

The *Budge* listing to allow you to draw icons is on yellow pages 104-106.

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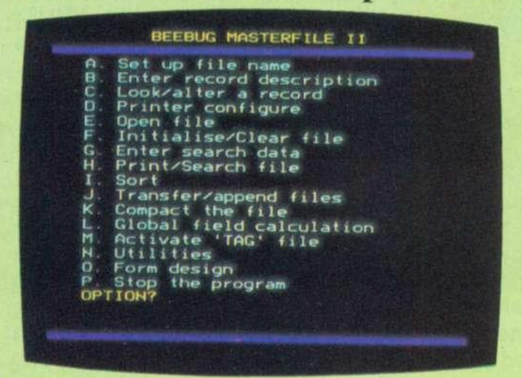
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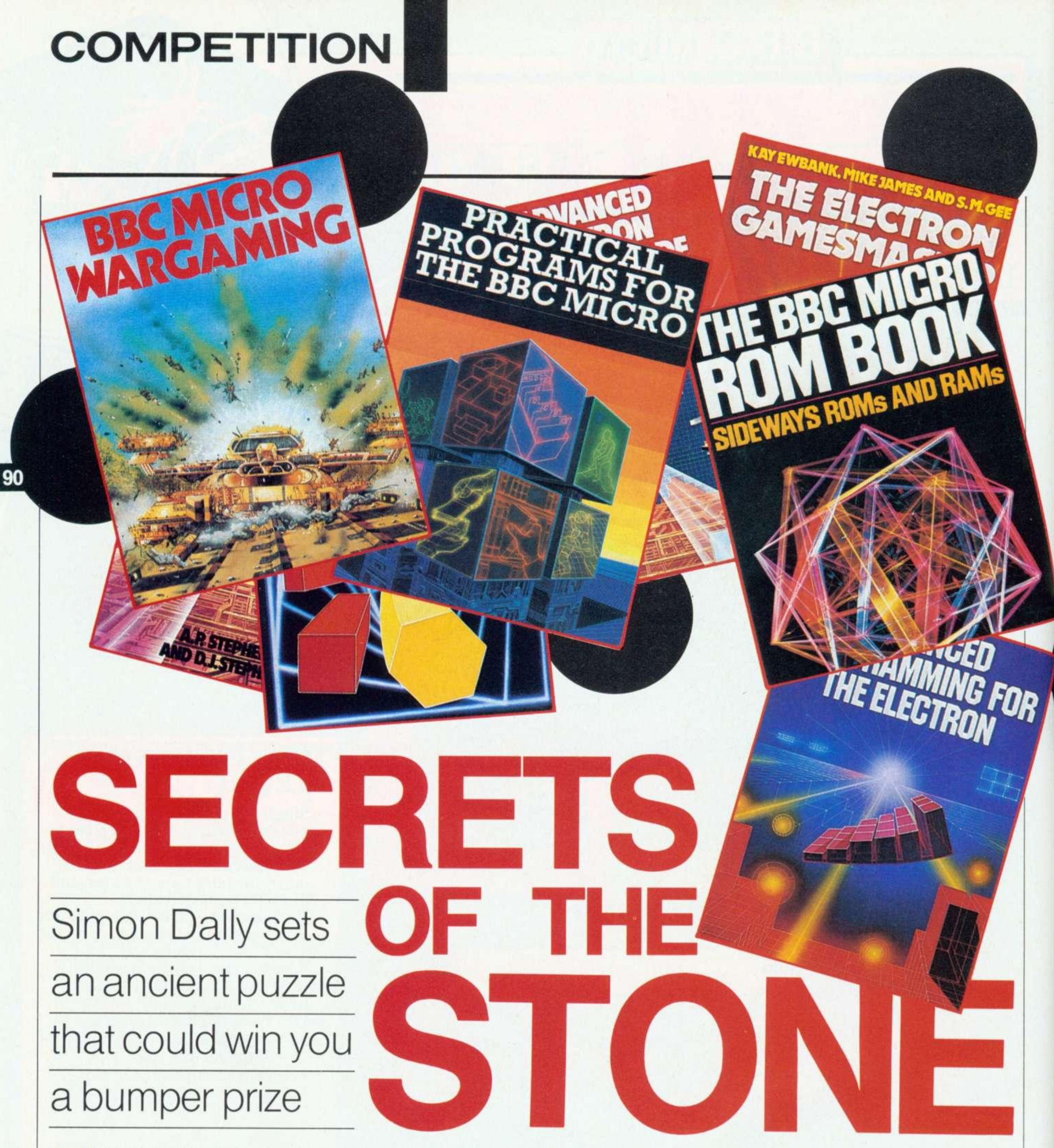
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SECRETS OF THE STONE

Simon Dally sets an ancient puzzle that could win you a bumper prize

TAKE A LOOK at figure 1. First analysis suggests nothing special about it, but closer inspection shows:

- It contains all the digits 0-9 exactly twice
- The 13 numbers obtained by reading from left to right and downwards are all exactly divisible by 7

So far, so good. There are many ways in which you can arrange the twenty digits to have this property. What makes this one special is that it was inscribed on a block of stone inside the step pyramid at Saqqara, constructed by the first recorded architect, Imhotep, in approximately 3000 BC. Accompanying hieroglyphics have been deciphered to read: 'Secret of Zoser, King of Upper and Lower Egypt'.

Zoser is known to have been a passionate mathematician and the appearance of a harp player on the stone suggests a general hymn of praise to the harmony of mathematics.

In 1932 an Egyptologist and mathematician, Dr Kirederf, caused a sensation by pointing out that the significance of this mysterious arrangement could be explained by posing the puzzle: 'How can you arrange the digits so as to obtain the highest possible sum from multiplying the 13 numbers?'. Astonishingly, the solution immortalised on the stone is not the highest possible product but the second highest!

The sensation was caused by the fact that it proved beyond doubt what many scholars had long suspected – that the Egyptians, or at least some of them, knew the decimal system. But it poses some intriguing questions. Did Imhotep, who was later himself deified, not know the highest (figure 2)? Or was he teasing the viewer to find the highest for himself?

Is there some deeper, so-far unperceived meaning?

We can only speculate.

In this month's puzzle you must follow the same rules (the same grid pattern, all digits used twice, all 13 numbers divisible by 7) to find the arrangement that gives the highest sum when the 13 numbers are *added* together.

There are two solutions – either will suffice.



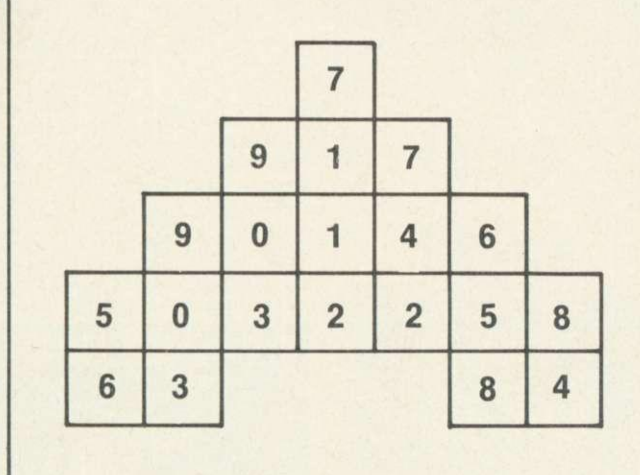


Figure 1. Saqqara stone

7
9 3 8
5 2 0 1 7
9 0 4 1 2 5 6
8 4 6 3

Figure 2. Highest possible product

PRIZES

THERE are 50 Acornsoft software packages, either for the BBC Micro or the Electron, to be won by the senders of the first correct answers out of the hat, so please state on your entry which Acorn micro you own – if you don't you'll be disqualified.

We've got 20 Granada books to give away as second prizes to 10 runners-up – two each for the next five correct entries from Electron owners and two each for five Beeb owners.

Answers on a postcard or back of an envelope, please, to arrive not later than May 3, 1985. Address your entries to April Competition, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

DECEMBER WINNERS

DECEMBER'S competition to win a bar code reader produced a healthy entry – nearly 400. However, unusually for this magazine, barely 10 per cent of entrants got it right, most of you stumbling over the mathematical questions: maybe Christmas went to your heads. The answers were as follows:

Problem 1: 987652413 – 102347586 = 885304827

Also allowed (just) was 012346587 as the minimum

Problem 2: $14^3 + 15^3 + 16^3 \ldots + 25^3 = 312^2$

Many of you fell into the trap of $25^3 + 26^3 \ldots + 29^3 = 315^2$

Problem 3: Mad Alex had 20 gallons

Problem 4: 772 peals

Table 1 A: Troll, B: Dwarf

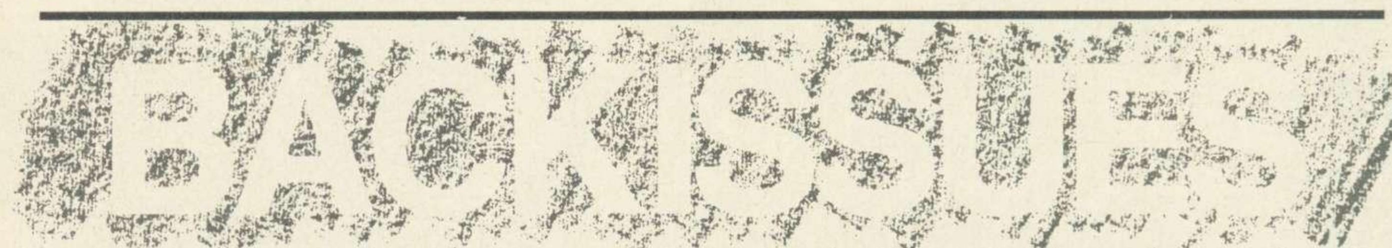
Table 2 A: Dwarf, B: Troll, C: Troll

Table 3 A: Dwarf, B: Troll, C: Dwarf

Table 4 A: Troll, B: Troll, C: Troll

Depending on your answer to question 1, therefore, the correct solution is either 1770708894 or 1950710892.

The winners of the bar code readers donated by Addison-Wesley were: John Hunt of Stockport, D G Hall of Crawley, Michael Warwick of Ascot, Graham Goddard of Yelverton and Sean McGoogan of Ayrshire. The five runners-up have been notified by post.

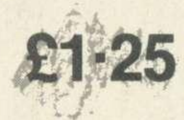


1. July/August 1982 The first issue. Articles on drawing techniques. The BBC Computer Programme. Machine code graphics. Questions & answers. Hints and Tips. Sound. Interfacing scientific instruments. Dumb Terminals for 0.1 machines. Disc drives. Econet in schools.

2. September Ceefax telesoftware. Beeb in business. Mailing list. Simple files. 30-Hour Basic course. Art on a micro. Music. BBC micro as a keyboard. Extra Atom commands. BBC Basic board. ULA design. Teletext graphics. Machine code graphics. Analogue input. Schools training. 0.1 cassette bug patch.

3. October Electron details. BBC TV series – confessions. Two Epson graphics dumps. Seikosha GP100 dump. Worldwide networking for BBC micro. Garbage handling. Voice ROMs. Sound pitch envelope. Moving graphics. ZX printer for Atom. RGB colour separations for Atom. Biofeedback. Book reviews.

4. November Teletext. Second BBC TV series. Machine code series 1. Programming forum. *Trek III*. Speeding up graphics. Bomber game listing. 7-tone Epson graphics dump. Atom graphics manipulation. Dumb terminal for 0.1 machine. Firework graphics. Editing tips.



5. December BBC TV in schools. Machine code 2 – registers. Programming forum. Program generators. Carols. Hints & Tips. Logo and Turtle graphics in schools. Introduction to procedures. Software review. Atom word processing. Toolbox review. 16-colour graphics on model A. Sorting. Sound envelope design.

6. January 1983 MEP school launch. *FX commands for sound. Second BBC TV series. Machine code 3 – two pass assembly. Disc drives for the Beeb. Programming forum. Program protection. Micros in schools – new series. Commodore Pet printer used with Beeb. BBC programs written on an Atom. Extra Atom memory.

7. February 1 MHz bus examined (4). 3D Atom graphics (3). Atom BBC Board reviewed (3). Machine code 4 – memory (5). BBC Computer Literacy update (1). Atom error handling (2). Micros in schools 2 – getting organised (6). Hints and Tips (4). Beeb Forum (3). Reviews of *Wordwise* (2) and the Amber printer (1).

8. March Chess on the BBC micro (3). Sound on the Beeb (4). Printers for beginners (4). Atom analogue converter (2). Schools 3 – micros and maths (6). Machine code 5 – indirect addressing (3). DIY lightpen (5). MEP's *Microprimer* review (2). Atom Ross toolkit review (1). Beeb Forum (2). Assembly language and Pascal book reviews (2).



9. April *Hexangle* game listing (4). Bach on the Beeb (4). Hints & Tips on disc drives (4). Machine code 6 – the CALL statement (4). Interfacing the 1 MHz bus (3). Schools 4 – young children and micros (6). Graphics listings (2). Printers for beginners 2 (4). Reviews of BCPL, educational software and Atom software (3).

10. May Review of Basic II(1). Graphics listings(1). New *FX calls in OS1.2(1). Colour mixing on the Beeb(4). Jazz, blues and folk on the BBC(6). Schools 5 – language development(6). DIY Beeb interface box(4). Atom sound board(5). A to Z of printing: how to get going(4). Hints and Tips: PROCs, discs and FNs(5). Printer, software and book reviews.

11. June Techniques series – sorting(2). Hints and Tips: 50p network(5). Drawing techniques and CAD(5). Machine code: interrupts(6). Schools



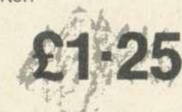
6 – information technology. Atom Forum. Beeb Forum. Printers – write your own graphics dumps(4). Comparative review of *View* and *Wordwise*(3). Three graphics packages reviewed(3). Test of *Acorn User*'s interface box(4).

12. July Techniques – hash tables(2). Hints and Tips: logic made easy(5). Recursion and graphics(6). Handling strings(3). Two ideas for passing variables(2). Beeb aids the blind(2). DIY second keyboard(5). Beeb Forum. Sounds on the Atom(2). Hardware, firmware, software and book reviews. Atom Forum.

13. August Printer graphics and dumps(2). Techniques – Tree structures and sorting(2). All the fun of the fair(7). 40/80 disc copier(2). Colour painting(5). Basic II: random access



files(2). Screen dumps for Olivetti, Centronics and Seikosha(5). Atom strings(3). Reviews of Tandy CGP115 printer, five educational packs, A to D converter.



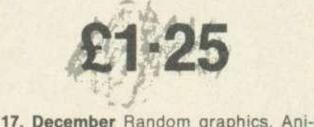
14. September Techniques – ink-blots and mazes. Painting by lightpen. DFS space explored. Beeb Forum. *Mega Monsters* game listing. Machine code graphics dumps. Atom Forum. Atom cassette recorder check. Reviews of Atom RAM boards, Cumana disc manual, *Logo* for schools, Hobbit floppy tape and books.

15. October Women and computing. Techniques – random numbers. Review of Computer Concepts' *Beebcalc*.



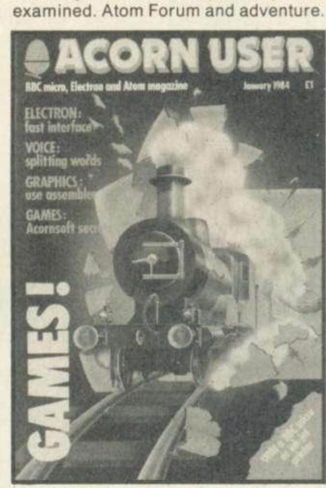
Fractal graphics. 57 files on 40 & 80 track discs. *Vampire* game listing. Beeb Forum. Assembly code controls tab key. Osfile merging. Atom future. Atom verify routine. Reviews of *Vu-Type*, Procyon Atom book, Epson FX80, Teletext adapter, disc drive, software.

16. November Techniques – impossible problems. Contour graphics. Connecting two Beebs together. XREF: sorts & lists variable, function and procedure names. Assembler utilities in Basic II. OS, VDU, *FX, OSBYTE calls – **pull-out poster**. Disc overlays. Adding extra Atom commands. Reviews of 7 educational packs, Atom ROM, books, games.



17. December Random graphics. Animated graphics in colour. Techniques – graphs. Hints & Tips. Universal printer dump. 6522 connected to the Electron. Saving machine code. Beeb Forum. Graphics **pull-out poster**. **Index:** July 82–July 83. Forum Extra: EQUS. BBC helps the disabled. Schools – data processing. Transferring data between Beebs, Atoms . . . or Pets. Atom block demolition utility. Atom disassembler program. Reviews of software, books, educational programs from Chalksoft.

18. January 1984: Games special issue Techniques – graphs part 2. Stacks and queues, Basic and languages. Hints & Tips. Voice chip revealed. How to write games. Electron interfacing. Beeb Forum. Life graphics routines. *Defencecom* game listing. *The Train Game* listing. Machine code graphics. Where to put machine code. Schools – handling data. Juki daisywheel printer examined. Atom Forum and adventure.

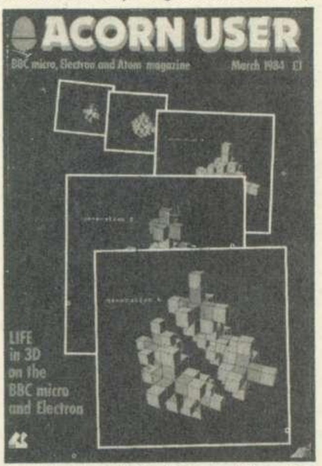


Reviews of utilities, software, *Beeline* wordprocessor, educational packages, two chess programs.

19. February: Adventures special issue Techniques – efficient sorts(3). PROC for a numeric keypad on the Beeb keyboard(1). 12 graphics listings(1). Random access filing on disc(5). Locking files(2). MCP40 printer/plotter looked at(5). Hints & Tips(3). Beeb Forum(2). Make discs readable on 40 and 80 track drives(4). Screen memory organisation(3). Hints on adventure design(3). Adventure action(4). Adventure ideas in computer language(2). Text compression(2). Word-crunch-

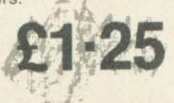
ing(4). VIA chip on Electron to drive a parallel printer(3). Atom Forum(2). Schools – simulation packages(4). Reviews: *Disc Doctor*, Leasalink's DFS upgrade, Hitachi's microdrive system, Solidisk's sideway RAM board, software.

20. March Utility: timing routine. Fractals. Teletext and mode 7 dump. ROMs reviewed. Hints & Tips. Beeb Forum. Add sounds to your games. Learn Lisp



1. Cube graphics. Printer driver for View. Basic II from Basic I. Beeb's ADC chip. Atom Forum. Listing formatter for the Atom. Atom 'bytes free' routine. Schools – test of *Factfile*. Keyboard skills. Amcom DFS v Acorn DFS. Reviews: *Beebpen* wordprocessor, Atom expansion system, software, books.

21. April Beeb graphics on TV(3). 6845 chip explored(3). Advanced filing systems(1). Lisp 2(4). Hints & Tips(3). Beeb Forum(4). Choose disc tracks to copy(4). Function key editing(4). Teletext dumps(3). CES scrutinised(3). Passing variables(2). Computer Concepts' graphics ROM(4). Schools – simulations(4). Calculating Easter dates(3). Better programming(3). Atom Forum(2). Atom ROM routines(5). Converting BBC to Atom Basic(2). Three printers compared(2). Reviews: software, Aries B20 RAM board, *Toolkit*, Monitors.



22. May Bitstik graphics system. Hints & Tips. 6502 second processor examined. Lisp 3. Beeb Forum. Disc utility to keep track of available space. Statistics. Pattern graphics. OSWORD explained. 4 colour graphics listings. Second-hand



disc drives. Education – do girls get a fair deal? Atom Forum. BBC to Atom Basic 2. Reviews: British Micro's Grafpad, *Edword* wordprocessor, 4 sprite generators, Opus microdrive, Beasty, software.

23. June Acorn Z80 second processor(3). Forth(2). Graphics to brighten up your games(2). Soft Pottery graphics(4). Go faster and save



memory space(3). Rapid search and load routine for tapes(2). How the Beeb and Electron work 1(3). Business: reviews and how to gently enter office computerisation(4). Education – adult literacy(3). Dumping Atom programs on the BBC(2). Atom Forum. Software copyright laws(2). Hints & Tips(4). Techniques – B-Trees(3). Beeb Forum(2). Reviews of monitors, printers, books, software, adventures, EPROM programmer.

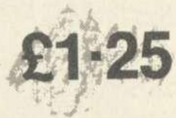
24. July Communications: the future; portable micros; modems & electronic mail. Hints & Tips. First Byte: using your micro. Beeb Forum on Basic. How it works II: slow down the Beeb. Business: Acorn's Z80 software, Starbase ROM. Education: a look at Edfax, how to teach facts. Atom Forum. Converting BBC to Atom Basic. Reviews:



Electron Plus-1, Solidisk's 128k RAM board, three IEEE interfaces, Canon colour and Brother printers, ADE ROM.

25. August Downloading the weather. Teaching tots: keyboard overlays, activity board. First Byte: writing & debugging programs. Hints & Tips. Beeb Forum: 6502 second processor & Tube tips. How it works III: random numbers. Business: Plan software for Z80. Atom Forum, avoiding errors. Reviews: 3 drawing packs, Torch Unicomm, MCP's Interbeeb, software plus for Micronet.

26. September Decoding radio signals, First Byte: getting moving. Hints & Tips. Education: problem solving. Sprite design and animation part I. Beeb Forum: fastest dump. Write your own disc formatter. How it works IV: random number generator. Business: Nucleus software for Z80, accounts. Atom Forum, ? and !. Reviews: Torch Unicorn, Quinkey, Parfitt plotter, Turbo compiler, Multi-aid.



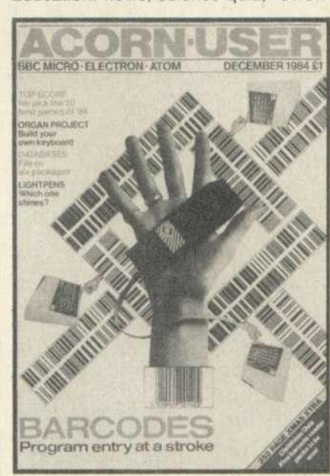
27. October The BBC and space. First Byte: noises on the Elk. Hints & Tips. Sprite design and animation part II. Programming the 8271. Sorting techniques. Diagnosing ills in the Beeb. Beeb Forum: NFS update. Education: report on government scheme, review of Microtext. Atom: wordprocessor. Communications: bulletin boards. Reviews: Basic utility ROMs, sideways ROM sockets, Bearsoft's Editor, Watford's Buffer & Backup, Ampersand's Colour module.

28. November Acorn's ABC range. First Byte: drawing. Hints & Tips: 3D-effect printing. Sprite design and animation part III. Floating point variables. ROM juggler. *Micro Live*. Education: news, Edword in the classroom, school quiz. Atom forum: hardware, the Auto command. Reviews: Six turtles and buggies. Toad's extension socket, Watford's Speech Synthesiser and



Beebfont ROM, BBtype, Romex 13 ROM board, 3 language coaching packs, two graphics tablets.

29. December Guide to bar codes. First Byte: text & graphics windows. Hints & Tips: control codes for Epsons. The Domesday project. Low-cost keyboard for the Beeb. Dumping games' screens. Speed up your micro. DIY database. Education: news, science quiz, review



of the Dudley suite of software. Atom: Forum, build a ROM pager, competition. Reviews: 6 databases compared, part I of lightpens, Acornsoft's Logo and Pascal, best games of 1984.

30. January 1985 Games special: Quadline, Picture Puzzle, musical tunes. Colourfill graphics. Hints & Tips. Operation



Raleigh report. Setting up your own teletext database. Second processors examined. Education: news, activity board revisited. Reviews: 6 wordprocessors compared, three astronomy packs, software for lightpens.

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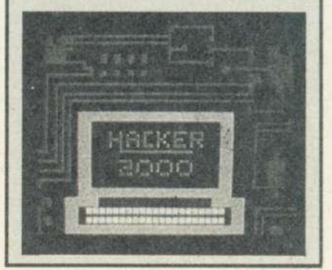


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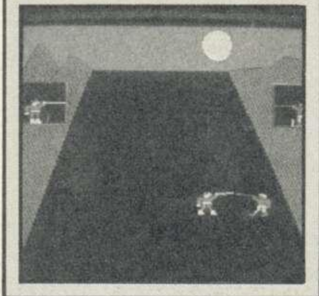




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SET UP A SIMPLE TOUCH SCREEN

by Alf Ripool

READERS who saw the February edition of *Micro Live*, will be familiar with the concept of touch screens. The one demonstrated at the start of the program relied on an additional piece of hardware to convert the screen into an area sensitive to touch.

All the actual hardware for such a useful item of software does exist within the BBC and Electron micros. In the Beeb the Cathode Ray Tube Controller and Video ULA handle the screen, while the two have been combined into a single ULA in the Electron. The real problems in utilising these exist in writing the software – this is complex and often the timings required are very delicate. However, the software exists within the MOS of both machines, as we shall see.

Figure 1. The paper template should only cover the top two-thirds of the screen and should be placed about 10 mm from the edge

The TV or monitor screen is primarily used to display the signal generated by your micro's video circuitry, but by reprogramming the correct sequence of video display registers it is possible to read the screen using a technique known as 'reverse polarisation' – the more technically-minded among you will probably know of this, however less learned readers can still use the technique, without understanding it. I would refer you to the *FTAD* Journal, of March 1982 for further details.

To use the MOS-based software we require just a simple machine code patch to ensure that the correct MOS addresses are set – this will of course depend on which issue Basic you have. Suitable PROCs are used to assemble the correct addresses. Note that it is not possible to use this program on the 6502 second processor because Hi-Basic is copyright 1983, and the transience across the Tube is not suitable for the I/O processor slave.

The program presented this month, will enable you to use this technique to set up and initialise a touch screen. The area used for the touch screen is the full width and about two-thirds of the screen's height; the lower third of the screen is used for messages and text. Figure 1 shows the dimensions of the template you should construct. For best results thin white paper works best – black paper is out due to its albedo factor. The edge of the paper should be about 10 mm in from the edge of the screen.

Next you need to mark out sections onto the template (figure 2). I find a heavy black felt-tip pen ideal for this. First mark a square about the size of your thumb in each corner of the template. Mark the other boxes as shown – again keep each to about thumb size.

When complete, fix the template onto the screen, using a clear stickytape that has a flour-free base.

Load and run the program. This will prompt you to initialise each 'pad' area on the screen. This must be done with care – if you are using an RGB monitor then you might need to repeat the process a couple of times due to the low phosphorescence screen ratios.

The program will first ask you to set the four corners of the screen so that it has a reference point. When prompted, use your thumb to cover the relevant square. During this time the MOS/patch will be scanning the video ULA to detect changes in polarisation. When you are sure that you have a firm and steady contact press the space bar. The area last detected with the most reverse polarisation (prior to pressing the space bar) will be selected as the appropriate point on the screen. Once each of the four screen corners have been set move onto the Yes, No and number boxes.

The touch screen can now be used as a direct replacement for the numbers and letters Y and N on the keyboard, and should work with any programs written in Basic you already have.

Next month I'll show just how simple it is to use the touch screen in this manner, with some simple but effective educational applications. In addition a short assembler routine will be supplied to allow a transparent version of the touch screen to be used with Acornsoft's *Elite*.

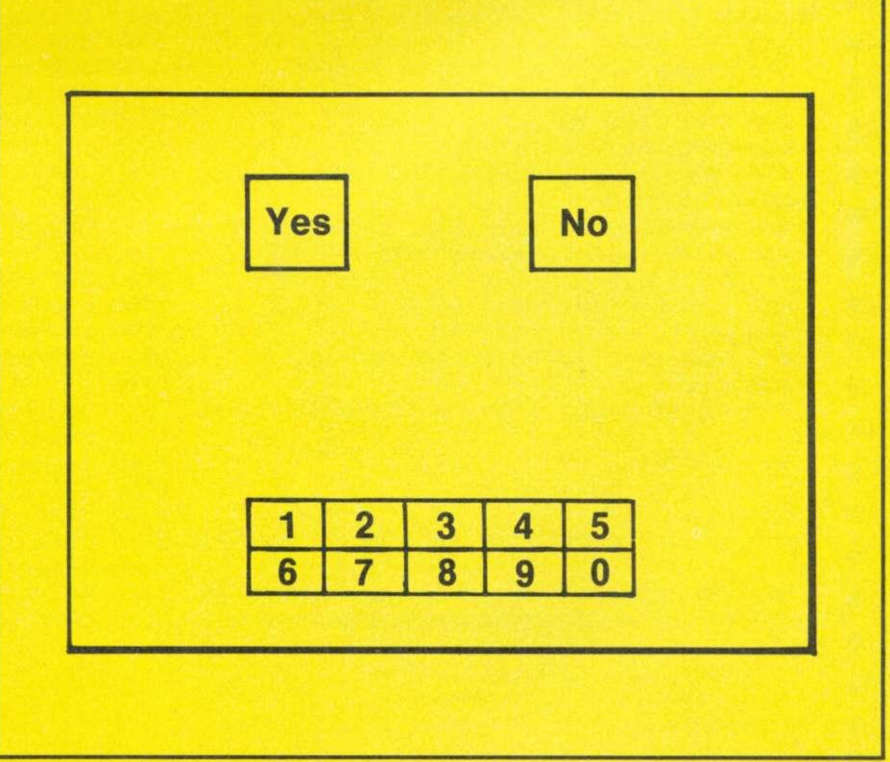


Figure 2. How to mark your template – use a heavy felt-tip pen

page 98 ▶

Using the paper overlay described on page 97 and this listing you can add a touch screen to your micro

```
   10 REM Touch Screen using MOS
   20 REM by Alf Ripool
   30 REM For BBC and Elk
   40 REM (c) Acorn User April 1985
   50 :
   60 DIM patch 20
   70 IF ?&8015=ASC("1") PROCbasicI
   80 IF ?&8015=ASC("2") PROCbasicII
   90 PROCassemble
  100 MODE0
  110 VDU 28,0,31,79,24
  120 ?patch=&60
  130 PRINT"INITIALISE SCREEN CORNERS:"
  140 PRINT"WHEN PROMPTED PLEASE PRESS";
  150 PRINT" SPECIFIED SCREEN CORNER," ;
  160 PRINT" & HOLD DOWN SPACE BAR"
  170 PRINT"UNTIL TOLD TO RELEASE"
  180 FOR N%=0 TO 5000:NEXT N%
  190 FOR L%=1 TO 4
  200 CLS
  210 READ A$
  220 PRINT"SET ";A$;" SCREEN, AND PRESS
 SPACE BAR TO CONFIRM"
  230 CALL patch
  240 REPEAT
  250 A%=255 : X%=1 : Y%=2 : C%=0
  260 CALL patch
  270 UNTIL GET=32
  280 A%=128 : X%=3 : Y%=78 : C%=1
  290 CALL patch
  300 CLS : PRINT A$;" SET"
  310 FOR N%=0 TO 5000:NEXT N%
  320 NEXT L%
  330 :
  340 CLS
  350 PRINT"PREPARE TO INITIALISE YES/NO
 SCREEN SEGMENTS"
  360 FOR N%=0 TO 617
  370 A%=96 : X%=96 : Y%=96 : C%=1
  380 CALL patch:NEXT N%
  390 FOR L%=1 TO 2
  400 READ A$
  410  PRINT"SET ";A$;", AND PRESS SPACE
 BAR TO CONFIRM"
  420 FOR N%=0 TO 142: CALL patch:NEXT
  430 REPEAT:CALL patch:UNTIL GET=32
  440 CALL patch
  450 CLS : PRINT A$;" SET"
  460 NEXT
  470 FOR N%=0 TO 489: CALL patch:NEXT
  480 CLS
  490 PRINT"PRESS Y ON KEYBOARD TO CONTI
NUE"
  500 REPEAT
  510  UNTIL GET=ASC"Y"
  520 CLS
  530 PRINT"PREPARE TO INITIALISE KEY-PA
D"
  540 FOR N%=0 TO 617:CALL patch:NEXT N%
  550 PRINT"PRESS N ON KEYBOARD TO CONTI
NUE"
  560 REPEAT: CALL patch
  570 UNTIL GET=ASC"N"
  580 CLS
  590  FOR L%=0 TO 9
  600 READ B%
  610 VDU30
  620  PRINT "PRESS ";CHR$(B%);" ON SCRE
EN";
  630  PRINT " - PRESS SPACE BAR TO CONF
IRM"
  640  REPEAT
  650 UNTIL GET=32
  660 VDU30:PRINTSTRING$(50," ")
  670 VDU 30
  680 PRINT"KEY ";CHR$(B%);" CONFIRMED"
  690 IF B%=48 THEN PRINTTAB(19,5);"0":G
OTO 710
  700  PRINTTAB(B%-49+EVAL(CHR$(B%)),5);
CHR$(B%)
  710 FOR D%=0 TO 5000:NEXT
  720 VDU30
  730 NEXT
  740 FOR D%=0 TO 5000:NEXT
  750 X%=1
  760 FOR L%=0 TO 9
  770 READ B%
  780 PRINTCHR$7;TAB(X%,5);CHR$(B%)
  790 X%=X%+2
  800 FOR D%=0 TO 3000:NEXT
  810 NEXT
  820 PRINTCHR$7;TAB(X%,5);CHR$(33)
  830 END
  840 :
  850 DEF PROCassemble
  860 P%=patch
  870 [
  880 LDA #&EA
  890 JSR read1
  900 ROL A
  910 JSR read2
  920 CLC : BIT ackn
  930 JMP trans
  940 ]
  950 ENDPROC
  960 :
  970 DEF PROCbasicI
  980 read1=&E072 : read2=&E981
  990 trans=&E109 : ackn=&E004
 1000 ENDPROC
 1010 :
 1020 DEF PROCbasicII
 1030 read1=&E089 : read2=&E999
 1040 trans=&E101 : ackn=&E00F
 1050 ENDPROC
 1060 DATA "TOP LEFT","TOP RIGHT"
 1070 DATA "BOTTOM LEFT","BOTTOM RIGHT"
 1080 DATA "YES SEGMENT","NO SEGMENT"
 1090 DATA 49,50,51,52,53,54,55,56,57,48
 1100 DATA 65,80,82,73,76,32,70,79,79,76
```

See 'Hints & tips', page 39

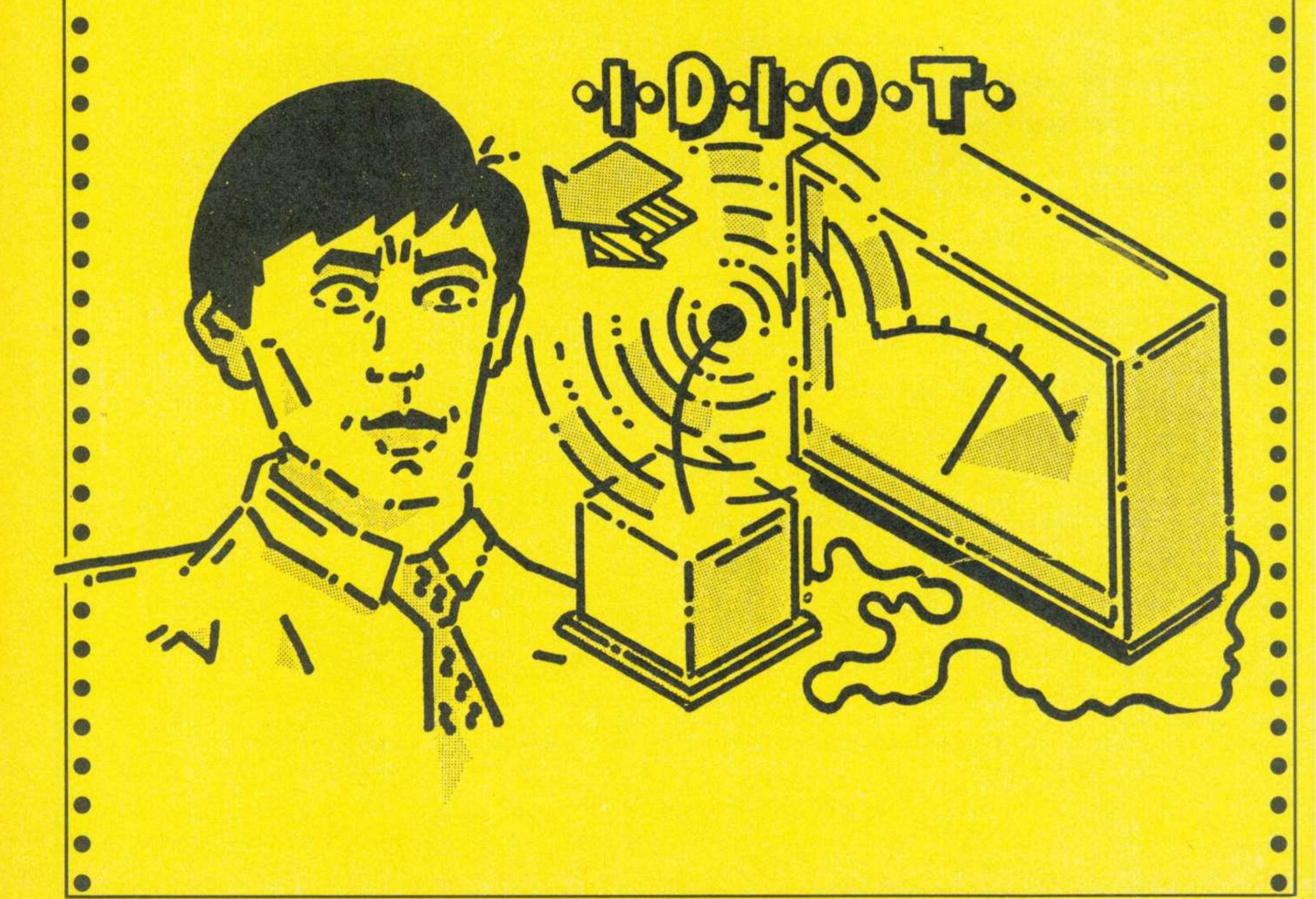
April Fool! Here's the listing to help you make fools of family and friends

```
10 REM Interactive Determination of
11 REM Intellectual Objectivity
12 REM Test Meter
20 REM Martin Phillips
30 REM For BBC and Electron
40 REM (C) Acorn User April 1985
50 :
60 MODE1
70 PROCinitialise
80 PROCinstructions
90 PROCscale
100 PROCrun
110 PROCcrash
120 END
130 :
140 DEF PROCinstructions
150 GCOL0,1
160 PROCdouble("Interactive Determination of",192,1007)
170 PROCdouble("Intellectual Objectivity Test Meter",96,928)
180 GCOL0,3
190 PRINT''" The computer is connected to a highly"
200 PRINT"sensitive amplifier which is able to"
210 PRINT"monitor low-level, high frequency"
220 PRINT"electromagnetic radiation."
230 PRINT" The human brain relies on tiny"
240 PRINT"electrical impulses to send messages."
250 PRINT"The strength and frequency of these"
260 PRINT"impulses are a measure of the activity"
270 PRINT"of the brain."
280 PRINT" This meter can detect these tiny"
290 PRINT"impulses and by measuring the frequency"
300 PRINT"and intensity of them is able to"
310 PRINT"determine one's IQ."
320 PRINT" The aerial must be 50cm from the fore-"
330 PRINT"head, and you must concentrate as hard"
340 PRINT"as possible on the simple problems"
350 PRINT"presented at the bottom of the screen,"
360 PRINT"and say the answers out loud."
370 PRINT" The computer then sets the rate at"
380 PRINT"which the problems are presented, until"
390 PRINT"it reaches an optimum speed. Then the"
400 PRINT"computer will be able to calculate and"
410 PRINT"display your IQ."'
420 VDU19,3,4,0,0,0
430 GCOL 0,1
440 PRINT SPC(8);"Press space to start"
450 REPEAT:UNTIL GET=32
460 ENDPROC
470 :
480 DEF PROCinitialise
490 *FX11,0
500 X1=156:Y1=693
510 VDU5
520 VDU19,0,7,0,0,0
530 VDU19,3,7,0,0,0
540 VDU23;8202;0;0;0;
550 PX=0:PY=0
560 *KEY10 OLD|M MODE1|M VDU23;8202;0;0;0;|M GOTO1390|M
570 ENDPROC
580 :
590 DEF PROCscale
600 GCOL0,128
610 CLG
620 GCOL0,3
630 FOR S=0 TO 20
640 angle=0.07*S+0.869:L=740
650 IF S MOD2=0 THEN L=L-24
660 IF S MOD4=0 THEN L=L-24
670 X=ABS(-640+(L*COS(angle)))
680 Y=120+L*SIN(angle)
690 MOVE X,Y
700 X=ABS(-640+(764*COS(angle)))
710 Y=120+764*SIN(angle)
720 DRAW X,Y
730 DRAW X1,Y1
740 IF S MOD4=0 THEN PROCdouble(STR$(S*10),X,Y+80)
750 X1=X:Y1=Y
760 NEXT S
770 ENDPROC
780 :
790 DEF PROCbezel(text$)
800 GCOL0,130
810 VDU24,0;0;1279;250;
820 CLG
830 GCOL0,3
840 X=640-(16*LEN(text$))
850 PROCdouble(text$,X,175)
860 VDU24,0;250;1279;1023;
870 ENDPROC
880 :
890 DEF PROCpointer(val)
900 GCOL0,0
910 PROCdrawpointer
920 angle=0.869+val*0.007
930 PY=50+750*SIN(angle)
940 PX=ABS(-640+680*COS(angle))
950 GCOL0,1
960 PROCdrawpointer
970 ENDPROC
980 :
990 DEF PROCdrawpointer
1000 MOVE(640-(200/TAN(angle))),252
1010 DRAW PX,PY
1020 ENDPROC
1030 :
1040 DEF PROCdouble(A$,K,L)
1050 A%=&A:X%=0:Y%=&A:D=&A00
```

continued ▶

◀ continued

```
1060 FOR T=1 TO LEN(A$)
1070 K1=K+(32*(T-2))
1080 B$=MID$(A$,T,1)
1090 ?D=ASC(B$)
1100 CALL &FFF1
1110 VDU23,240,D?1,D?1,D?2,D?2,D?3,D?3,D
?4,D?4
1120 VDU23,241,D?5,D?5,D?6,D?6,D?7,D?7,D
?8,D?8
1130 MOVE K1,L:PRINTCHR$(240);
1140 MOVE K1,L-32:PRINTCHR$(241);
1150 NEXT T
1160 ENDPROC
1170 :
1180 DEF PROCrun
1190 angle=1.57
1200 FOR N=1 TO 30
1210 PROCsum
1220 I=INKEY(200-5*N)
1230 PROCpointer(50+N*3+RND(20)-RND(20))
1240 NEXT N
1250 FOR N=50 TO -60 STEP-5
1260 PROCsum
1270 I=INKEY(RND(25))
1280 PROCpointer(50+N*2+RND(20)-RND(20))
1290 NEXT N
1300 ENDPROC
1310 :
1320 DEF PROCcrash
1330 FOR N=1 TO 200
1340 VDU19,0,(RND(15)),0,0,0
1350 VDU19,1,(RND(15)),0,0,0
1360 VDU19,2,(RND(15)),0,0,0
1370 VDU19,3,(RND(15)),0,0,0
1380 NEXT N
1390 VDU19,0,0,0,0,0
1400 VDU19,1,0,0,0,0
1410 VDU19,2,0,0,0,0
1420 VDU19,3,0,0,0,0
1430 SOUND1,-15,4,255
1440 *FX200,1
1450 *MOTOR1
1460 VDU4,14
1470 REPEAT
1480 FOR N=1 TO 35:PRINT:NEXT N
1490 UNTIL 0
1500 ENDPROC
1510 :
1520 DEF PROCsum
1530 a$=STR$(1+RND(9))
1540 b$=STR$(1+RND(9))
1550 PROCbezel(a$+" x "+b$+" = ")
1560 ENDPROC
```



See, 'Colours by Interrupts', page 73

Tristram Mabbs' listing allows you to have high-resolution, multi-coloured graphics without losing too much memory

```
   10 REM Colours by Interrupts
   20 REM By Tristram Mabbs
   30 REM for BBC Micro
   40 REM (c) Acorn User April 1985
   50 :
   60 DIM DLIs 50
   70 Line_Val=&260
   80 REM Set up demonstration
   90 FOR A=0 TO 17 STEP 3
  100 A!DLIs=4*Line_Val
  110 ?(A+DLIs+2)=(((A/3)AND7)+1)OR&10
  120 NEXT A
  130 A!DLIs=TRUE
  140 MODE 6
  150 REM PROCsetdlis does the work
  160 PROCsetdlis(DLIs)
  170 REM Insert "L." into input buffer
  180 *FX138,0,76
  190 *FX138,0,46
  200 *FX138,0,13
  210 END
  220 :
10000 DEF PROCsetdlis(Data)
10010 A%=135:Mode=((USR(&FFF4)AND&FF0000
)/&10000)
10020 DIM Code FNassemble(0,&C000)
10030 A=FNassemble(0,Code)
10040 A=FNassemble(2,Code)
10050 A=?Data+&A8:?Data=A
10060 Data?1=((Data?1)+((A AND &F00)/&10
0)+6)
10070 CALL Vec_Setup
10080 ENDPROC
10085 :
10090 DEF FNassemble(Pass,Adr)
10100 P%=Adr:[OPT Pass
10110 \ Change the IRQ1 vector
10120 .Vec_Setup SEI
10130 LDA&204:STA OldIrq:LDA&205:STA Old
Irq+1
10140 LDA#NewIrq AND&FF:STA&204:LDA#NewI
rq/256:STA&205
10150 CLI:RTS
10160 .OldIrq BRK:BRK
10170 \ New interrupt routine
10180 .NewIrq LDA&FC:PHA:TXA:PHA:TYA:PHA
10190 LDA&FE4D:AND&FE4E:AND#&20
10200 BNE DLI
10210 LDA&FE4D:AND&FE4E:AND#2
10220 BNE FSI
10230 .Irq_Exit PLA:TAY:PLA:TAX:PLA:STA&
FC:JMP(OldIrq)
10240 \ Interrupts identified
10250 .FSI LDA&FE4E:AND#&20:BEQ Irq_Exit
10260 LDA#0:STA ColCount
10270 \ DLI routine
10280 .DLI STA&FE4D
10290 LDX ColCount
10300 LDA Data+1,X:AND Data,X:CMP#&FF:BN
EP%+10:LDA#0:STAColCount:JMP Time
10310 LDA Data+2,X:AND#&F0
10320 LSRA:LSRA:LSRA:LSRA:TAY
10330 LDA Data+2,X:AND#&F:EOR#7
10340 ]:ON Mode+1 GOSUB 10490,10570,1067
0,10490,10570,10490:[OPT Pass
10350 \ Set the timer
10360 .Time LDA&FE4B:AND#&DF:STA&FE4B
10370 LDX ColCount
10380 LDA Data,X:STA&FE48:INX:LDA Data,X
:STA&FE49
10390 INX:INX:STX ColCount
10400 LDA#&A0:STA&FE4D:STA&FE4E
10410 JMP Irq_Exit
10420 \ Assorted data
10430 .ColCount BRK
10440 .Col2base EQUB0:EQUB&80
10450 .Col4base EQUB0:EQUB&20:EQUB&80:EQ
UB&A0
10460 .Col16base BRK
10470 \ The colour routines
10480 ]:=P%-Adr
10490 REM 2 Colour
10500 [OPT Pass
10510 PHA:TYA:AND#1:TAY:PLA
10520 ORA Col2base,Y
10530 LDX#7
10540 .C2_loop STA&FE21:CLC:ADC#&10:DEX:
BPL C2_loop
10550 ]
10560 RETURN
10570 REM 4 Colour
10580 [OPT Pass
10590 PHA:TYA:AND#3:TAY:PLA
10600 ORA Col4base,Y
10610 LDX#3
10620 STA&FE21:CLC:ADC#&10:STA&FE21
10630 CLC:ADC#&30:STA&FE21
10640 CLC:ADC#&10:STA&FE21
10650 ]
10660 RETURN
10665 :
10670 REM 16 Colour
10680 [OPT Pass
10690 STA Col16base
10700 TYA:ASLA:ASLA:ASLA:ASLA
10710 ORA Col16base
10720 STA&FE21
10730 ]
10740 RETURN
10745 :
10750 DEF PROCdlisoff
10760 ?&FE4E=&20:ENDPROC
10765 :
10770 DEF PROCdlison
10780 ?&FE4E=&A0:ENDPROC
```

HOW TO ENTER THE PROGRAM

The program can be broken down into three sections; the demonstration section (lines 10 to 150), the DLI core routine and utilities (lines 10000 to 10080 and 10750 to 10780) and the assembly section. To enter the program, first enter the following short routine:

```
 10 Data=&4000
 20 Data1=Data:Data2=Data
 30 FOR Mode=0 TO 2
 40 L=FNassemble(0,&4000)
 50 L=FNassemble(2,&4000)
 60 B=0
 70 FOR A=&4000 TO &4000+L-1
 80 B=B+?A
 90 NEXT A
100 PRINT"Checksum is :";B
110 NEXT Mode
120 END
```

Save this as you will be able to use it with next month's program for mode changing. Then type AUTO 10090 and enter the assembly language section. If you now type RUN, three checksums, &4D83, &524C and &4A59, should be printed. If so, you can now delete lines 10 to 120 and enter the remainder of the program. If not, or if an error occurs, check the listing and correct the error. Note that the REM statements at lines 10110, 10170, 10240, 10270, 10350, 10420 and 10470 are not essential and can be shortened or ignored. Lines 10490, 10570 and 10670 can be ignored if line 10340 is altered. With the entire program entered, **save the program before running it in case an error still exists, as an error in the interrupt routine may corrupt the entire program.**

See 'Watch Your Screen for a Good Plot', page 82

Plotting equations on screen is easy using Nigel Jennings' *Graph* listing

```
10 REM Graph
20 REM by Nigel Jennings
30 REM For BBC and Electron
40 REM (c) Acorn User 1985
50 :
60 A$=STRING$(78," ")
70 B$=STRING$(78," ")
80 DIM Code$(11)
90 DIM Code%(8)
100 DIM Yvalues(201)
110 FOR I%=1 TO 11
120 READ Code$(I%)
130 NEXT
140 DATA "AO","SF","AX","AS","PL"
150 DATA "OP","SP","SD","RS","C","E"
160 MODE 7
170 PROC_HELP
180 MODE 0
190 PROC_INITIALISE
200 ON ERROR PROC_ERROR
210:
220 REPEAT
230 PROC_INPUT
240 IF A$="H" MODE 7:PROC_HELP:MODE 0:P
ROC_VDU:UNTIL FALSE
250 IF NOT Code%(6) CLG
260 PRINTTAB(0,31);"Y="A$;
270 IF Code%(3) PROC_AXES
280 PROC_PLOT((40-XA%)/60/SF,1)
290 IF Code%(8) PROC_DUMP
300 UNTIL FALSE
310 END
320 :
330 DEF PROC_INITIALISE
340 XA%=640 : YA%=528
350 PROC_VDU
360 SF=1
370 FOR I%=3 TO 8
380 IF I%<6 Code%(I%)=-1 ELSE Code%(I%)
=0
390 NEXT
400 PROC_DISPLAYCODE
410 ENDPROC
420 :
430 DEF PROC_VDU
440 VDU 29,XA%;YA%;
450 VDU 28,0,31,79,31
460 ENDPROC
470 :
480 DEF PROC_INPUT
490 REPEAT
500 CLS
510 INPUT TAB(0,31) "Y=" A$
520 I%=1
530 REPEAT
540 IF A$=Code$(I%) PROC_READCODE:PROC_
INPUT ELSE I%=I%+1
550 UNTIL I%>11
560 UNTIL A$<>""
570 IF A$="H" ENDPROC
580 IF A$="RP" A$=B$ ELSE B$=A$
590 ENDPROC
600 :
610 DEF PROC_READCODE
620 IF I%>2 AND I%<9 Code%(I%)=NOT Code
%(I%):PROC_DISPLAYCODE
630 IF A$="AO" PROC_ORIGIN:PROC_DISPLAY
CODE:ENDPROC
640 IF A$="SF" PROC_SCAFAC:PROC_DISPLAY
CODE:ENDPROC
650 IF A$="RS" PROC_INITIALISE:ENDPROC
660 IF A$="C" PROC_DISPLAYCODE:ENDPROC
670 IF A$="E" PROC_END
680 ENDPROC
690 :
700 DEF PROC_DISPLAYCODE
710 PRINTTAB(0,31);"AO: ";XA%;",";YA%;
720 PRINTTAB(17);"SF: ";SF;
730 FOR I%=3 TO 8
740 IF Code%(I%) PRINTTAB(I%*10-3);Code
$(I%);
750 NEXT
760 C$=INKEY$(500)
770 ENDPROC
780 :
790 DEF PROC_PLOT(S,I%)
800 IF Code%(5) P%=69 ELSE P%=5:X=S:Y=E
VAL(A$):PLOT 4,X*60*SF,Y*48*SF
810 FOR X=S TO (1240-XA%)/60/SF STEP .1
/SF
820 Y=EVAL(A$)
830 IF Code%(7) Y=Y+Yvalues(I%)
840 PLOT P%,X*60*SF,Y*48*SF
850 Yvalues(I%)=Y
860 I%=I%+1
870 NEXT
880 IF Code%(3) PROC_SCALE
890 ENDPROC
900 :
910 DEF PROC_AXES
920 MOVE 40-XA%,0
930 DRAW 1240-XA%,0
940 MOVE 0,48-YA%
950 DRAW 0,1008-YA%
960 ENDPROC
970 :
980 DEF PROC_SCALE
990 VDU 5
1000 @%=&02010A
1010 REM x-axis
1020 FOR XC%=40-XA% TO 1240-XA% STEP 120
1030 REM Graduations
1040 MOVE XC%,-10
1050 DRAW XC%,10
1060 REM Scale points
1070 MOVE XC%-120,-30
1080 IF Code%(4) PRINT XC%/60/SF
1090 NEXT
1100 REM y-axis
1110 FOR YC%=48-YA% TO 1008-YA% STEP 96
1120 REM Graduations
1130 MOVE -5,YC%
1140 DRAW 5,YC%
1150 REM Scale points
1160 MOVE -85,YC%+15
1170 IF Code%(4) AND YC%/48/SF<>0 PRINT
YC%/48/SF
1180 NEXT
1190 @%=&0A
1200 VDU 4
```

```
1210 ENDPROC
1220 :
1230 DEF PROC_ORIGIN
1240 REPEAT
1250 INPUT TAB(0,31) "Enter Origin: x-co
ord,y-coord :" XA%,YA%
1260 UNTIL XA%>=0 AND XA%<1280 AND YA%>=
0 AND YA%<1024
1270 XA%=60*((XA%-10)DIV 60)+40
1280 YA%=48*((YA%-28)DIV 48)+48
1290 VDU 29,XA%;YA%;
1300 ENDPROC
1310 :
1320 DEF PROC_SCAFAC
1330 REPEAT
1340 INPUT TAB(0,31) "Enter Scale Factor
: " SF
1350 UNTIL SF>0
1360 ENDPROC
1370 :
1380 DEF PROC_END
1390 VDU 26
1400 CLS
1410 END
1420 ENDPROC
1430 :
1440 DEF PROC_ERROR
1450 REM 17=Escape 18=Div by Zero 20=Too
 Big 21=-ve Root 22=Log Range
1460 IF ERR=17 ENDPROC
1470 IF ERR=18 OR ERR=20 PROC_PLOT(X+.1/
SF,I%+1)
1480 IF (ERR=21 OR ERR=22) AND SGN(X)=-1
 PROC_PLOT(.1/SF,100)
1490 ENDPROC
1500 :
1510 DEF PROC_HELP
1520 VDU 23,1,0;0;0;0;
1530 PRINT''TAB(8);"OUTPUT CONTROL CODES
"'
1540 PRINTTAB(11);"Print Control"'
1550 PRINT "AO : Axis Origin";SPC(13);":
640,528"
1560 PRINT "SF : Scale Factor";SPC(12);"
: 1"
1570 PRINT "AX : Axes";SPC(20);": on"
1580 PRINT "AS : Axis Scales";SPC(13);":
on"
1590 PRINT "PL : Dotted Plot Line";SPC(8
);": on"
1600 PRINT "OP : Overprint";SPC(15);": o
ff"
1610 PRINT "SP : Superposition last plot
 : off"
1620 PRINT "SD : Screen Dump";SPC(13);":
off"'
1630 PRINTTAB(10);"Program Control"
1640 PRINT "RP : Repeat last plot"
1650 PRINT "RS : Reset codes to default"
1660 PRINT "H  : Display this list"
1670 PRINT "C  : Display current codes"
1680 PRINT "E  : End program"
1690 C$=INKEY$(800)
1700 ENDPROC
1710 :
1720 DEF PROC_DUMP
1730 REM Insert Screen Dump Routine here
1740 ENDPROC
```

See 'Move Over for Budge', page 86

Brian Lienard's *Budge* graphics editor lets you design icons for your micro

```
10 REM Budge
20 REM by Brian Lienard
30 REM For BBC and Electron
40 REM (C) Acorn User April 1985
50 :
60 *FX144,0,1
70 IF ?&FFFE=164 THEN E%=0 ELSE E%=96
80 MODE4:VDU19,0,4;0;
90 DIMvdu$(14),val%(14,8),mode$(3)
100 mode$(1)="ERASE":mode$(2)="DRAW "
110 mode$(3)="MOVE "
120 PROCsetchars
130 PROCtitle
140 PROCquestions
150 PROCdisplay(H%,W%)
160 L%=0:R%=W%*8-1:T%=0:D%=H%*8-1
170 M%=3:X%=0:Y%=0
180 PROCcomlist
190 *FX4,1
200 :
210 REPEAT
220 PRINTTAB(X%,Y%);:Z%=GET AND &DF
230 IF Z%=139 AND Y%>T% THEN PROCup
240 IF Z%=138 AND Y%<D% THEN PROCdn
250 IF Z%=136 AND X%>L% THEN PROClt
260 IF Z%=137 AND X%<R% THEN PROCrt
270 IF Z%=68 THEN M%=2:PROCmode
280 IF Z%=69 THEN M%=1:PROCmode
290 IF Z%=77 THEN M%=3:PROCmode
300 IF Z%=86 THEN PROCsave:G%=0:PROCpr
ocess:PROCcomlist:PROCrestore
310 IF Z%=76 THEN PROCload
320 UNTIL Z%=81 OR Z%=113
330 :
340 G%=1:PROCprocess
350 CLS:PRINT''"Do you want to save ";
360 PRINT"VDU23 statements in a file";
370 PRINT" or print them on the";
380 PRINT" screen?"''
390 PRINT"Press : F for file"
400 PRINTSPC(8);"S for screen";
410 REPEAT Z%=GET AND &DF
420 UNTIL Z%=70 OR Z%=83
430 IF Z%=70 THEN PROCfile : END
440 CLS:FORC%=0TO14:PRINTvdu$(C%):NEXT
450 PRINT"Now LOAD your program and CO
PY over'"
460 PRINT"the statements to merge them
 with it."
470 *FX4,0
480 END
490 :
500 DEF PROCfile
510 PRINT''"Please enter File name :";
520 REPEAT:INPUT F$:UNTIL F$<>""
530 F$=LEFT$(F$,7):CHAN=OPENOUT(F$)
540 FOR C%=0 TO W%*H%-1
550 FOR I%=1 TO LEN(vdu$(C%))
560 BPUT#CHAN,ASC(MID$(vdu$(C%),I%,1))
570 NEXT
580 BPUT#CHAN,13:NEXT:CLOSE#CHAN
590 PRINT''"Now LOAD your program ";
600 PRINT"and *EXEC ";F$;" to"
610 PRINT" merge the VDU23 statements
with it"
620 *FX4,0
630 ENDPROC
640 :
650 DEFPROCprocess
660 PROCcls
670 PRINT TAB(15,27);"Processing";
680 FOR C%=0 TO W%*H%-1
690 P%=(C% MOD W%)*8-1
700 Q%=(C% DIV W%)*8-1
710 IF G%=1 THEN vdu$(C%)=STR$(LI+C%*1
0)+"VDU23,"+STR$(U%+C%)
720 FORI%=1 TO 8:V%=128:S%=0
730 FORJ%=1 TO 8
740 PRINTTAB(P%+J%,Q%+I%);
750 A%=135
760 IF(USR(&FFF4)AND&FFFF)DIV &100=233
-E% THEN S%=S%+V%:IF G%=1 THEN PRINT"#";
770 V%=V%/2
780 NEXT J%
790 IF G%=1 THEN vdu$(C%)=vdu$(C%)+","
+STR$(S%) ELSE val%(C%,I%)=S%
800 NEXT I%
810 IF G%=1 THEN PRINTTAB(P%+1,Q%+1);S
TR$(U%+C%);
820 NEXT C%
830 IF G%=0 THEN PROCview
840 PRINTTAB(8,27);"Press any key to c
ontinue";:Z%=GET
850 ENDPROC
860 :
870 DEFPROCmode
880 PRINTTAB(25,30);mode$(M%);
890 PROCupdate:ENDPROC
900 :
910 DEFPROCcls
920  FORY%=24 TO 31
930 PRINTTAB(0,Y%);SPC(39);
940 NEXT:ENDPROC
950 :
960 DEFPROCsave
970 K%=X%:O%=Y%:ENDPROC
980 :
990 DEFPROCrestore
1000 X%=K%:Y%=O%
1010 PRINTTAB(X%,Y%);
1020 ENDPROC
1030 :
1040 DEFPROCsetchars
1050 VDU23,224,255,128,128,128,128,128,
128,129
1060 VDU23,225,255,1,1,1,1,1,1,129
1070 VDU23,226,129,128,128,128,128,128,
128,255
1080 VDU23,227,129,1,1,1,1,1,1,255
1090 VDU23,228,129,0,0,0,0,0,0,255
1100 VDU23,229,255,0,0,0,0,0,0,129
1110 VDU23,230,129,128,128,128,128,128,
128,129
1120 VDU23,231,129,1,1,1,1,1,1,129
1130 VDU23,232,129,0,0,0,0,0,0,129
1140 VDU23,233,255,255,255,255,255,255,
255,255
1150 VDU23,234,60,66,153,161,161,153,66
,60
1160 ENDPROC
1170 :
1180 DEF PROCdisplay(H%,W%)
1190 CLS:FOR B%=0 TO H%-1
1200 FOR A%=0 TO W%-1
1210 X%=A%*8:Y%=B%*8:PROCtile(X%,Y%)
1220 NEXT:NEXT:ENDPROC
1230 :
1240 DEFPROCtile(X%,Y%)
1250 PRINTTAB(X%,Y%);CHR$(224);
1260 FOR I%=1 TO 6:PRINTCHR$(229);:NEXT
1270 PRINTCHR$(225)
1280 FOR J%=Y%+1 TO Y%+6
1290 PRINTTAB(X%,J%);CHR$(230);
1300 FOR I%=1 TO 6:PRINTCHR$(232);:NEXT
1310 PRINTCHR$(231);
1320 NEXT
```

```
1330 PRINTTAB(X%,Y%+7);CHR$(226);
1340 FOR I%=1 TO 6:PRINTCHR$(228);:NEXT
1350 PRINTCHR$(227);
1360 ENDPROC
1370 :
1380 DEFPROCcomlist
1390 PRINTTAB(0,24);"Mode: Press D=draw
, E=erase, M=move."
1400 PRINT"Move: Cursor keys = up,down,
left,right."
1410 PRINT"View: Press V to view at nor
mal size."
1420 PRINT"Load: Press L to load VDU23
statement."
1430 PRINT"Quit: Press Q to quit defini
tion."
1440 PRINTTAB(8,30);"Current mode is: "
;:COLOUR1:PRINTmode$(M%):COLOUR3
1450 ENDPROC
1460 :
1470 DEFPROCup
1480 Y%=Y%-1:PROCupdate:ENDPROC
1490 :
1500 DEFPROCdn
1510 Y%=Y%+1:PROCupdate:ENDPROC
1520 :
1530 DEFPROClt
1540 X%=X%-1:PROCupdate:ENDPROC
1550 :
1560 DEFPROCrt
1570 X%=X%+1:PROCupdate:ENDPROC
1580 :
1590 DEFPROCupdate
1600 PRINTTAB(X%,Y%);
1610 ON M% GOTO 1620,1630,1640
1620 PROCerase:GOTO 1640
1630 PRINTCHR$(233);
1640 ENDPROC
1650 :
1660 DEFPROCerase
1670 PRINTTAB(X%,Y%);
1680 A%=X% MOD 8:B%=Y% MOD 8:F%=0
1690 IF A%=0 AND B%=0 THEN PRINTCHR$(22
4);:F%=1
1700 IF A%=0 AND B%=7 THEN PRINTCHR$(22
6);:F%=1
1710 IF A%=7 AND B%=0 THEN PRINTCHR$(22
5);:F%=1
1720 IF A%=7 AND B%=7 THEN PRINTCHR$(22
7);:F%=1
1730 IF A%=0 AND B%>0 AND B%<7 THEN PRI
NTCHR$(230);:F%=1
1740 IF A%=7 AND B%>0 AND B%<7 THEN PRI
NTCHR$(231);:F%=1
1750 IF A%>0 AND A%<7 AND B%=0 THEN PRI
NTCHR$(229);:F%=1
1760 IF A%>0 AND A%<7 ANDB%=7 THEN PRIN
TCHR$(228);:F%=1
1770 IF F%=0 THEN PRINTCHR$(232);
1780 ENDPROC
1790 :
1800 DEFPROCquestions
1810 PRINTTAB(0,15);"No.of chars.across
(1-5,default=1)";
1820 REPEAT INPUT W%
1830 UNTIL W%=0 OR W%<5
1840 IF W%=0 THEN W%=1
1850 PRINT'"No.of chars. down (1-3,defa
ult=1)";
1860 INPUT H%:IF H%=0 THEN H%=1
1870 IF H%>3 THEN PRINT CHR$(7);:GOTO 1
860
1880 PRINT'"ASCII codes for chars.to st
art at"
1890 PRINTSPC(12);"(224-";256-H%*W%;",d
efault=224)";
1900 INPUT U%:IF U%=0 THEN U%=224
1910 IF U%>256-H%*W% THEN PRINTCHR$(7);
:GOTO1900
1920 PRINT'"1st line no.for VDU23 state
ments"
1930 PRINTSPC(11);"(1-32000,default=101
0)";
1940 INPUT LI:IF LI=0 THEN LI=1010
1950 IF LI<=0 OR LI>32000 THEN PRINTCHR
$(7);:GOTO1940
1960 ENDPROC
1970 :
1980 DEFPROCtitle
1990 CLS
2000 PRINTTAB(5,2);"* BUDGE ";CHR$(234)
;" by Brian Lienard."
2010 PRINTTAB(5,4);"B BBC    (& Electron
)"
2020 PRINTTAB(5,5);"U  User-"
2030 PRINTTAB(5,6);"D    Defined"
2040 PRINTTAB(5,7);"G     Graphics"
2050 PRINTTAB(5,8);"E      Editor."
2060 ENDPROC
2070 :
2080 DEFPROCview
2090 PRINTTAB(8,31);"Latest  view is:--
----->";
2100 FOR C%=0 TO H%*W%-1
2110 VDU23,235,val%(C%,1),val%(C%,2),va
l%(C%,3),val%(C%,4),val%(C%,5),val%(C%,6
),val%(C%,7),val%(C%,8)
2120 PRINTTAB(C% MOD W%+33,C% DIV W%+32
-H%);CHR$(235);
2130 NEXT
2140 M%=3
2150 ENDPROC
2160 :
2170 DEFPROCload
2180 PROCsave:PROCcls
2190 PRINTTAB(0,25);"LOAD: Which tile a
cross(1-";W%;"/1)";
2200 INPUT P%:IF P%=0 THEN P%=1:GOTO 22
20
2210 IF P%<1 OR P%>W% THEN PRINTTAB(31,
25);CHR$(7);SPC(4);:GOTO2190
2220 PRINTTAB(0,26);SPC(5);"Which tile
down (1-";H%;"/1)";
2230 INPUT Q%:IF Q%=0 THEN Q%=1:GOTO225
0
2240 IF Q%>H% THEN PRINTTAB(31,26);CHR$
(7);SPC(4);:GOTO2220
2250 PROCtile((P%-1)*8,(Q%-1)*8)
2260 PRINTTAB(0,28);"Type in values fro
m VDU23 statement:"
2270 FOR I%=1 TO 8
2280 PRINTTAB(0,29);"Dot value for row
";
2290 COLOUR1:PRINT;I%;:COLOUR3
2300 PRINT" (0-255/0)";:INPUTN%
2310 IF N%<0 OR N%>255 THEN PRINTTAB(30
,29);CHR$(7);SPC(5);:GOTO2280
2320 V%=128
2330 FOR J%=1 TO 8
2340 IF N% DIV V%=1 THEN PRINTTAB((P%-1
)*8+J%-1,(Q%-1)*8+I%-1);CHR$(233);:N%=N%
-V%
2350 V%=V%/2:NEXTJ%
2360 PRINTTAB(30,29);SPC(5):NEXT I%
2370 PROCcls: M%=3: PROCcomlist: PROCre
store
2380 ENDPROC
```

Program notes ▶

BUDGE PROGRAM NOTES

In the following brief description of the parts of the program, the only deviousness occurs in lines 70 and 760. Line 70 finds out whether we are running under OS 0.1 or 1.0 and later, or the Electron. The value of O is set to either 0 or 96. Line 760 reads the ASCII code of the character at the current screen cursor position (I know there is an *FX call to do this but it isn't implemented in version 0.1 of the OS). The code given here works, but returns values differing by 96 for each OS, hence line 60.

Main Program Lines 60–610. Setting up is done in lines 60–190. The main 'set and do a command' loop runs from 210 to 320. Commands are recognised and executed in lines 230 (up), 240 (down), 250 (left), 260 (right), 270 (mode = draw), 280 (mode = erase), 290 (mode = move), 300 (view) and 310 (load). Line 320 traps all other keys as errors. The REPEAT . . . UNTIL loop is exited when the quit command is given. Lines 340-610 set up the VDU23 statements, ask whether they are to be displayed on the screen or sent to a file, do as requested and end the program.

PROCprocess Lines 650–850. Process tile display and construct the VDU23 statements. It is a triple nest of loops over each tile within the display, then rows within tiles, then dots within rows.

PROCmode Lines 870–890. Displays the new mode and updates the cell where the cursor is currently located.

PROCcls Lines 910–940. Clears the command summary area of the screen.

PROCsave Lines 960–970. Remembers where the cursor was when the display for View or Load commands is processed.

PROCrestore Lines 990–1020. Reverse of PROCsave.

PROCsetchars Lines 1040–1160. Set up the graphics characters needed to draw the tile display.

PROCdisplay Lines 1180–1220. Calls PROCtile repeatedly to draw the display.

PROCtile Lines 1240–1360. Draws one character 'tile' on the screen.

PROCcomlist Lines 1380–1450. Prints command summary.

PROCup, PROCdn, PROClt & PROCrt Lines 1470–1570. Move the current cursor position (X%,Y%) in the appropriate direction and update the tile display accordingly.

PROCupdate Lines 1590–1640. Put the cursor in the right place and then, depending on the mode, draw a block, erase a block or do nothing.

PROCerase Lines 1660–1780. Erasing a block is easy – what you put in its place to restore the tile array is more difficult. All those IFs do the trick – work it out!

PROCquestions Lines 1800–1960. Asks all the questions that need answers before you can get started.

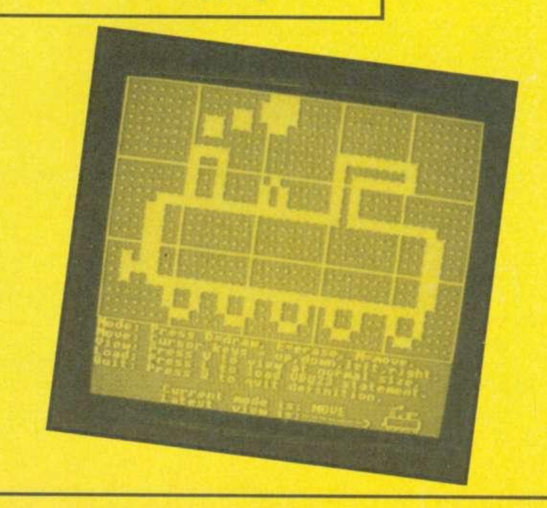
PROCtitle Lines 1980–2060. Displays the program title.

PROCview Lines 2080–2150. After a call to PROCprocess this routine repeatedly sets up character no. 235 and puts it on the screen in the right place so you can see what your efforts look like actual size.

PROCload Lines 2170–2380. Implements the Load command. Asks which tile and then sets eight values and puts the block patterns they represent onto the screen.

Because the program is quite well structured it's relatively easy to extend. You can add a line in the main command loop to recognise a new command, mention it in PROCcomlist and a new prodecure to do what you want. For example, I have implemented a slide command that lets you slide rectangular pieces of the tile display about. Another possibility is a command to read VDU23 statements into the display from an ASCII file you have prepared from an existing program.





See 'Beeb Forum', page 115

Listing 1. Chris Davies' program to trap the Break key using the ON ERROR sequence

```
   10 REM Trap Break/Reset with ON ERROR
   20 REM by Chris Davies
   30 REM for BBC and Electron
   40 REM (c) Acorn User April 1985
   50 :
   60 oldvec=&70
   70 errvec=&202
   80 osbyte=&FFF4
   90 P%=&900
  100 [
  110 \ Restore error vector
  120 \ to Basic's ON ERROR
  130 LDA oldvec
  140 STA errvec
  150 LDA oldvec+1
  160 STA errvec+1
  170 \
  180 \ initialise ROMs
  190 LDA #143
  200 LDX #1
  210 LDY #&E
  220 JSR osbyte
  230 LDX #2
  240 JSR osbyte
  250 LDX #3
  260 LDY #&FF
  270 JSR osbyte
  280 \
  290 \ create error 100 (Break)
  300 BRK
  310 ]
  320 $P%=CHR$(100)+"BREAK"+CHR$(0)
  330 :
  340 REM Point Break vector to
  350 REM Machine code patch - JMP &900
  360 *FX 247,76
  370 *FX 248,0
  380 *FX 249,9
  390 count=1
  400 :
  410 ON ERROR PROCerror
  420 :
  430 REM Save Basic error vector
  440 ?&70=?&202:?&71=?&203
  450 :
  460 REPEAT
  470 count=count+0.5
  480 UNTIL FALSE
  490 END
  500 :
  510 DEF PROCerror
  520 REPORT:PRINT" at line ";ERL
  530 :
  540 REM Escape stops program
  550 IF ERL=17 A%=247:X%=0:Y%=0:CALL osbyte:END
  560 REM also removes patch - *FX247,0
  570 IF ERL=100 PRINT"Press RETURN";:REPEAT UNTIL GET=13:PRINT
  580 ENDPROC
```

Listing 2. Stewart Marshall's procedure to make the computer ignore redundant letters of the alphabet

```
   10 REM PROC_search
   20 REM by Stewart Marshall
   30 REM For BBC and Electron
   40 REM (c) Acorn User April 1985
   50 :
   60 MODE 6
   70 CLS
   80 PRINT TAB(3,4);STRING$(31,"*")
   90 PRINT TAB(3,5);"*"TAB(33,5);"*"
  100 PRINT TAB(3,6);"*"TAB(13,6);"PROC_search"TAB(33,6);"*"
  110 PRINT TAB(3,7);"*"TAB(33,7);"*"
  120 PRINT TAB(3,8);STRING$(31,"*")
  130 PRINT
  140 PRINT "This procedure searches for a specified"
  150 PRINT "word or series of words in the answer"
  160 PRINT "inputted by the student. It ignores any"
  170 PRINT "extra words, spelling mistakes and"
  180 PRINT "typing errors that the student might"
  190 PRINT "make."
  200 PRINT
  210 PRINT "What follows is a test-drive program."
  220 PRINT TAB(0,22);"Press any key."
  230 A$=GET$
  240 CLS
  250 REPEAT
  260 PRINT TAB(0,5);"WORDS REQUIRED BY TEACHER"
  270 INPUT TAB(0,7) teacher$
  280 PRINT TAB(0,10);"STUDENT'S ANSWER TO BE CHECKED"
  290 INPUT TAB(0,12) student$
  300 PROC_search(student$,teacher$)
  310 IF FD%=1 THEN PRINT TAB(0,15);"That's correct. Very good." ELSE PRINT TAB(0,15);"Sorry, but that's not correct."
  320 PRINT TAB(0,18);"TEST DRIVE AGAIN (Y/N)"
  330 again$=GET$
  340 CLS
  350 PROC_search(again$,"N")
  360 UNTIL FD%=1
  370 END
  380 :
  390 DEF PROC_search(reply$,answer$)
  400 reply$=" "+reply$
  410 IF reply$=" " THEN PRINT "You don't seem to have typed anything."
  420 FD%=0:SPACE%=0:LK%=1:R%=0
  430 REM  Removing all but the bare
  440 REM  essentials from the answer$
  450 VOWEL$="AEIOUYHaeiouyh"
  460 an$=LEFT$(answer$,1)
  470 FOR N=2 TO LEN(answer$)
  480 X%=0
  490 IF MID$(answer$,N-1,2)="SC" OR MID$(answer$,N-1,2)="sc" THEN X%=1
  500 IF MID$(answer$,N,1)=MID$(answer$,N-1,1) THEN X%=1
  510 FOR Y=1 TO LEN(VOWEL$)
  520 IF MID$(answer$,N,1)=MID$(VOWEL$,Y,1) THEN X%=1
  530 NEXT Y
  540 IF MID$(answer$,N-1,1)=" " THEN X%=0
  550 IF X%=0 THEN an$=an$+MID$(answer$,N,1)
  560 NEXT N
  570 REM    Checking the reply$
  580 REPEAT
  590   R%=R%+1
  600   Aasc%=ASC(MID$(an$,LK%,1))
  610   Rasc%=ASC(MID$(reply$,R%,1))
  620   IF Aasc%=32 THEN SPACE%=LK%
  630   IF Rasc%>96 THEN Rasc%=Rasc%-32
  640   IF Aasc%>96 THEN Aasc%=Aasc%-32
```

Continued ▶

See 'Testing Your Resistance', page 119

Listing 1. Paul Beverley's automatic resistance measurement program

```
10 REM Auto resistance measurement
15 REM By Paul Beverley
20 REM For BBC and Electron-Plus1
25 REM (c) Acorn User April 1985
30 :
40 MODE 7
50 PROCinitialise
60 REPEAT
70 PROCread_Rs
80 Rx=(65520/FNADC1-1)*Rs+.0005
90 PROCcalc_range
100 PROCprint_prompts
110 PROCdisplay_result
120 PROCchange_timing
130 UNTIL 0
140 END
150 :
160 DEF PROCinitialise
170 ON ERROR MODE 7:PROCerror:END
180 min%=400
190 ave%=2
200 places%=6
210 blank$=STRING$(18," ")
220 *FX16,4
230 VDU23,1,0;0;0;0;
240 *FX225,128
250 ENDPROC
260 :
270 DEF PROCread_Rs
280 Rs=1022.56
290 REPEAT UNTIL ADVALODIV256=4
300 IF ADVAL(4)<min% Rs=110.98
310 IF ADVAL(3)<min% Rs=11.0065
320 IF ADVAL(2)<min% Rs=1.0113
330 IF ADVAL(1)<min% Rs=1022.6
340 switch%=3-INT(LOG(Rs)/LOG(10))
350 ENDPROC
360 :
370 DEF FNADC1
380 *FX16,1
390 total%=0
400 FOR K%=1TOave%*50
410 IF ave%>4 IF K%MOD50=0 PRINT TAB(0
,23);ave%-K%DIV50;"  ";
420 REPEAT UNTILADVALODIV256
430 total%=total%+ADVAL1
440 NEXT
450 *FX16,4
460 =total%/ave%/50
470 :
480 DEF PROCcalc_range
490 range%=4-LOG(Rx)/LOG(5)
500 IF range%>3 range%=3
510 ENDPROC
520 :
530 DEF PROCprint_prompts
540 D$=blank$
550 IF range%>0 D$="CLOSE SWITCH  "+ST
R$(range%)
560 PROCdprint (0,0,D$)
570 D$=blank$
580 IF switch%>0 D$="SWITCH  "+STR$(sw
itch%)+"  CLOSED"
590 PROCdprint (19,0,D$)
600 ENDPROC
610 :
620 DEF PROCdisplay_result
630 IF ave%>4 VDU7
640 R$=LEFT$(STR$(Rx),places%)+" k ohm
s  "
650 IF Rx>1000 R$=LEFT$(STR$(Rx/1000),
places%)+" M ohms   "
660 IF Rx<1 R$=LEFT$(STR$(Rx*1000),pla
ces%)+" ohms   "
670 PROCdprint(12,10,R$)
680 ENDPROC
690 :
700 DEF PROCdprint(X%,Y%,Z$)
710 PRINT TAB(X%,Y%) CHR$(141);Z$
720 PRINT TAB(X%,Y%+1) CHR$(141);Z$
730 ENDPROC
740 :
750 DEF PROCchange_timing
760 REPEAT
770 G%=INKEY(0)
780 IF G%=128 ave%=ave%*2
790 IF G%=129 ave%=ave%/2
800 IF ave%=0 ave%=1
810 UNTIL G%<0
820 PRINT TAB(0,23);SPC(4)
830 IF ave%>4 PRINT;ave%;" "; ELSE PRI
NT "  ";
840 ENDPROC
850 :
860 DEF PROCerror
870 VDU23,1,1;0;0;0;
880 *FX225,1
890 REPORT
900 PRINT " at line ";ERL
910 ENDPROC
```

◀ *Continued*

```
650   IF Aasc%=67 THEN Aasc%=83
660   IF Rasc%=67 THEN Rasc%=83
670   IF Rasc%=Aasc% THEN PROC_found E
LSE PROC_notfound
680 UNTIL R%=LEN(reply$) OR FD%=1
690 ENDPROC
700 :
710 DEF PROC_notfound
720 IF Rasc%=32 THEN LK%=SPACE%+1
730 ENDPROC
740 :
750 DEF PROC_found
760 IF LK%=LEN(an$) THEN FD%=1 ELSE LK
%=LK%+1
770 ENDPROC
```

TOP OF THE LIST

Bob Tinley of Binley Woods, Coventry, supplies the first Top of the List for 1985. Bob's routine, which runs on both the BBC micro and Electron, allows you to have 40 characters per line in mode 2 – twice as many as normal. It's possible to redefine part or all of the ASCII character set by hand using the VDU23 option, but this is very tedious.

Bob's program reads the standard 8*8 bit pattern and compresses it onto a 4*8 bit matrix. It then writes a character string at the position of the graphics cursor in the current foreground colour, but does not otherwise affect the screen background colour.

The program is written in assembler, but this should not stop anyone unfamiliar with programming in assembler entering it. When run, the machine code generated is stored above HIMEM, which is lowered slightly to allow for this. The machine code is then saved by the last line of the program. You can check that your assembler is correct by entering the following two lines after you have run the program:

```
1Z%=0:FOR N%=&2E00 TO &2F56:Z%=Z%+?N%:NEXT
2PRINT "Checksum is : ";Z% : END
```

The correct code will produce the result:

"Checksum is : 41049"

Using the program is quite simple. First ensure that HIMEM has been set to &2E00 to protect subsequent loading of the machine code. Then load the machine code using *LOAD SLIM. Next reset the User Vector to point to the machine code:

U% = &200 : U%?0 = 0 : U%?1 = &2E

The slim string can then be written at the position of the graphics cursor using *LINE. To print 'Acorn User' at the centre of the mode 2 screen use:

MODE 2 : MOVE 640,512 : *LINE Acorn User

Listing 2 is a demonstration program using this technique.

Listing 1. Bob Tinley's program allows you 40 characters per line in mode 2

```
 10 REM Slim characters in Mode 2
 20 REM by Bob Tinley
 30 REM for BBC Micro and Electron
 40 REM (c) Acorn User April 1985
 50 :
 60 HIMEM=&2E00
 70 osword =&FFF1:oswrch =&FFEE
 80 osnewl =&FFE7
 90 string =&70   :char   =&72
100 forecol=&7B  :gline  =&7C
110 mask    =&7D  :screen =&7E
120 top     =&81  :pix    =&83
130 flag    =&84  :oldtop =&85
140 gcell   =&D6  :userv  =&200
150 glin    =&31A :col    =&359
160 flag    =&84  :oldtop =&85
170
180 FOR pass=0 TO 3 STEP 3
190 P%=&2E00
200 [OPT pass
210 .line
220 CMP #1 :BEQ slim
230 RTS
240 .slim
250 LDA #5 :JSR oswrch
260 STX string :STY string+1
270 LDA #&19 :JSR oswrch
280 LDA #0 :LDY #5
290 .sli
300 JSR oswrch
310 DEY :BNE sli
320 JSR colour
330 LDA glin    :STA gline
340 LDA gcell   :STA oldtop
350 LDA gcell+1:STA oldtop+1
360 STA oldtop+1
370 LDY #0
380 .character
390 LDA (string),Y
400 CMP #&D   :BEQ slimen
410 STA char
420 TYA:PHA
430 LDX #char:LDY #0
440 LDA #&A   :JSR osword
450 JSR slimchar
460 LDX #1
470 LDA oldtop   :STA top
480 LDA oldtop+1:STA top+1
490 LDY gline
500 .charline
510 TYA:CLC:ADC top
520 STA screen
530 LDA top+1
540 STA screen+1
550 TXA:PHA:TYA:PHA
560 JSR pair
570 PLA:TAY:PLA:TAX
580 CMP #8:BEQ nextcha
590 INX:INY
600 CPY #8:BNE charline
610 LDY #0
620 LDA top :CLC
630 ADC #&80:STA top
640 LDA top+1
650 ADC #&2 :STA top+1
660 CMP #&80:BCC charline
670 SEC:SBC #&50
680 STA top+1:JMP charline
690 .slimen
700 JMP slimend
710 .nextcha
720 JMP nextchar
730 .pair
740 LDY #0
750 .pair1
760 LDA (screen),Y
770 ASL char,X
780 BCC pair2
```

Continued ▶

◀ Continued

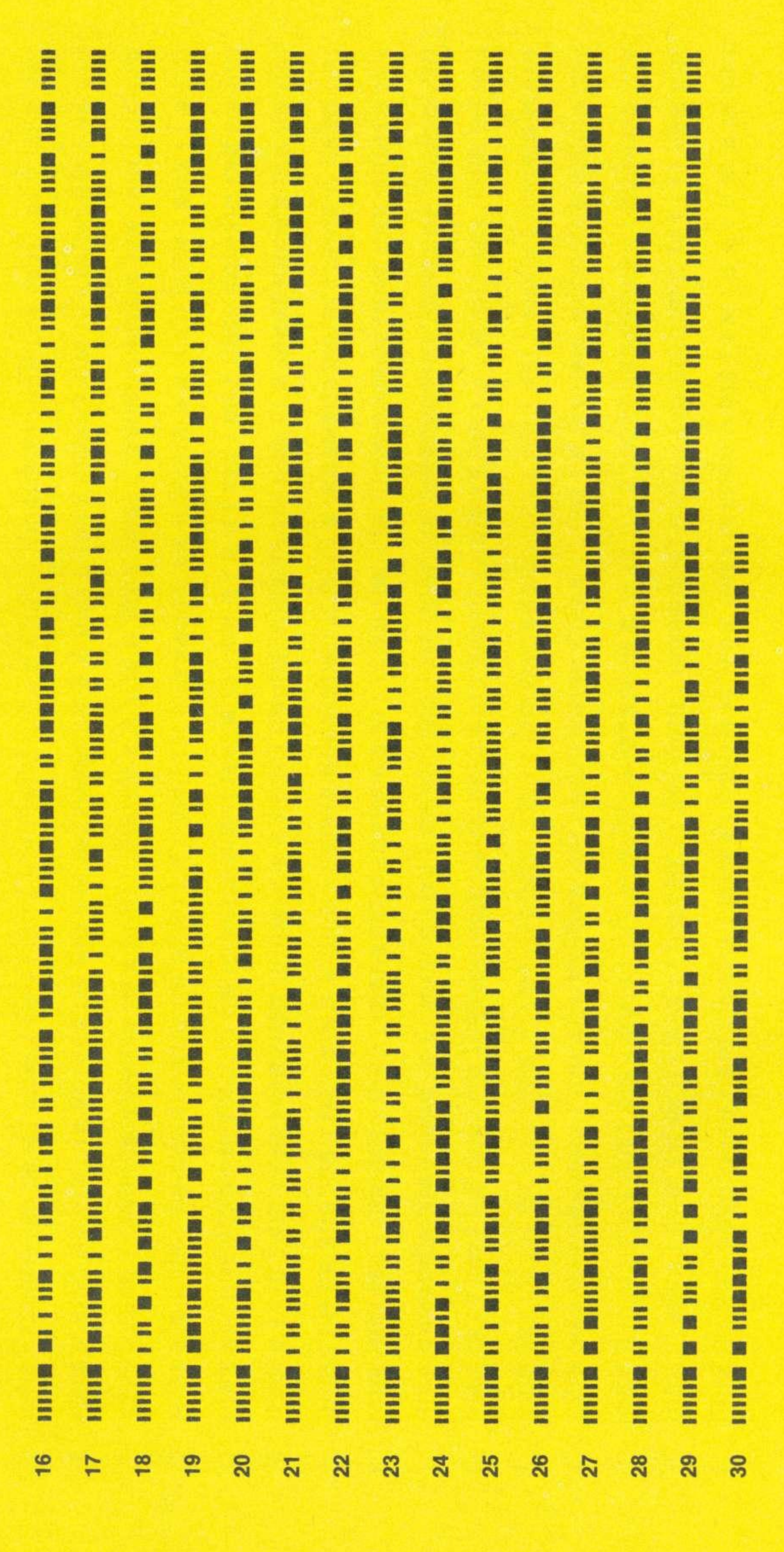
```
 790 AND #&55
 800 ORA forecol
 810 .pair2
 820 LSR forecol
 830 ASL char,X
 840 BCC pair3
 850 AND #&AA
 860 ORA forecol
 870 .pair3
 880 ASL forecol
 890 STA (screen),Y
 900 CPY #0:BNE pairend
 910 LDY #8
 920 JMP pair1
 930 .pairend
 940 RTS
 950 .slimchar
 960 LDX #8
 970 LDA char
 980 CMP #116:BEQ tf4
 990 CMP #102:BEQ tf4
1000 CMP #52 :BEQ tf4
1010 CMP #74 :BEQ J
1020 .slim1
1030 LDA #0:STA pix
1040 LDA #&80:STA mask
1050 LDY #4
1060 .slim2
1070 TYA:PHA:LDY #2:CLC
1080 LDA #0:STA flag
1090 .slim3
1100 LSR mask
1110 LDA char,X
1120 AND #&FE
1130 BIT mask:BEQ slim4
1140 LDA #1:STA flag
1150 .slim4
1160 DEY:BNE slim3
1170 CLC
1180 LDA flag:BEQ slim5
1190 SEC
1200 .slim5
1210 ROL pix
1220 PLA:TAY
1230 DEY:BNE slim2
1240 LDY #4:LDA pix
1250 .slim6
1260 ASL A
1270 DEY:BNE slim6
1280 STA char,X
1290 DEX:BNE slim1
1300 RTS
1310 .tf4
1320 TXA:PHA:LDX #8
1330 .tf41
1340 LSR char,X
1350 DEX:BNE tf41
1360 PLA:TAX:JMP slim1
1370 .J
1380 TXA:PHA:LDX #6
1390 .J1
1400 LDA char,X:AND &FB
1410 STA char,X
1420 LDA char+1:ORA &7E
1430 STA char+1
1440 DEX:BNE J1
1450 PLA:TAX:JMP slim1
1460 .colour
1470 LDA col
1480 AND #&AA
1490 STA forecol
1500 RTS
1510 .nextchar
1520 LDA oldtop:CLC
1530 ADC #&10:STA oldtop
1540 LDA oldtop+1:ADC #0
1550 STA oldtop+1
1560 CMP #&80:BNE next1
1570 SEC:SBC #&50
1580 STA oldtop+1
1590 .next1
1600 PLA:TAY
1610 INY:JMP character
1620 .slimend
1630 JMP osnewl
1640 ]
1650 NEXT pass
1660  *SAVE SLIM 2E00 2F57
```

Listing 2. Demonstration of slim characters

```
 10 REM Slim characters test
 20 REM by Bob Tinley
 30 REM for BBC micro & Electron
 40 REM (c) Acorn User April 1985
 50 :
 60 *LOAD  SLIM
 70 U%=&200:U%?0=0:U%?1=&2E
 80 MODE2
 90 VDU23;8202;0;0;0;
100 :
110 REPEAT
120 REPEAT B%=RND(8)-1:F%=RND(8)-1:UNT
ILB%<>F%
130 GCOLO,128+B%:CLG:GCOLO,F%
140 COLOUR 128+B%:COLOUR F%
150 MOVE0,900
160 *LINE QUICK BROWN FOX JUMPS OVER T
HE LAZY DOG.
170 MOVE0,700
180 *LINE quick brown fox jumps over t
he lazy dog.
190 MOVE480,500
200 *LINE 0123456789
210 MOVE160,300
220 *LINE !"#$%&'()*+,-./:;<=>?@[\]^`_
{|}
230 VDU4:PRINTTAB(0,30);"ANY KEY  to c
ontinue";
240 G%=GET
250 UNTIL FALSE
```

Program 1. Beeb Forum, page 115

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BAR CODES will revolutionise the way we use computers in applications as well as the way we load data. Here is the chance to get experience of this important development by ordering the Addison Wesley/MEP Bar Code Teaching Pack (see our January issue, page 129) direct through *Acorn User*.

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Acorn User will be printing some listings in bar code format in each issue and making booklets of bar codes available by mail order. Book publishers are already printing listings in bar code format, in fact Bruce Smith's latest book *The BBC Micro Machine Code Portfolio* has 13 pages of bar code listings.

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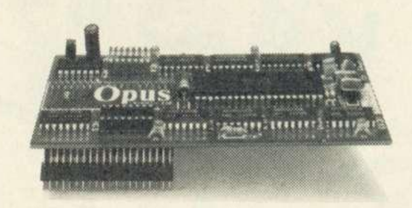
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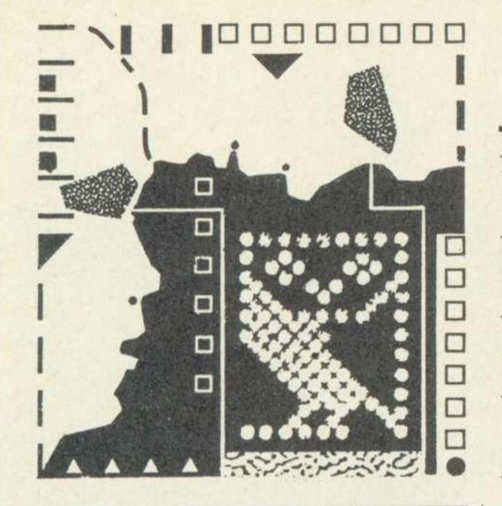
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Your tips selected by Bruce Smith, including a way to trap the Break key and how to teach your machine to ignore your spelling mistakes



The Break key trap

IT'S possible to trap the Break key by using Basic's ON ERROR sequence. Chris Davies of Hove shows you how...

The error vector must be copied to two spare locations immediately after the ON ERROR statement in a Basic program has been executed. Since there is a vector available (MOS 1.0+ only) to intercept the Break key (using OSBYTEs 247–249), this can be used to restore this error vector into Basic when Break is pressed (even with Control or Shift!) and then generate the error 'Break' to return control to the Basic interpreter via ON ERROR...

The advantage over the method of program trapping published in *Acorn User* (July 1984) is that no variables are lost by putting OLD and RUN into the keyboard buffer. The only disadvantage I have found with my routine is that *COMPACT destroys a disc rather than compacting the programs on it! All other DFS operations work correctly (I've checked both the Acorn and Watford 1.30 DFS).

The example program (listing 1 on page 107) counts continuously using a floating-point number; normally this would be lost after Break/Reset. The routine can be disabled with *FX247. Programmers should, however, provide a way of exiting their program – *without* having to switch off the computer!

I see no reason why the routine should not work on the Electron, other than that lines 180–270 may have to be omitted. For tape users (Beeb & Electron) the origin of the code (currently &900) will have to be altered if the cassette system is going to be used (try DIM mc 60:P% = mc).

£10 Help your micro understand you

PROCs away! Stewart Marshall from Sheffield sends a useful procedure that will be lapped up by those of you writing CAL programs. Stewart explains...

It is frustrating for students completing a computer assisted learning program to be told that they have given an incorrect answer when the only mistake they have made is a spelling or typographical error. My program (listing 2 on page 107) is a simple procedure designed to accept ordinary language input and avoid this situation.

When calling the procedure, the first parameter is supplied by the student's reply, and the second by the teacher/programmer as the word or group of words that he or she is looking for. The procedure then searches for the word or group of words in the student's reply. The search is deemed successful (by returning the value of FD% as 1) even if he or she has inserted extra characters or words; typed in upper and/or lower case; or made any of the more common spelling mistakes.

The procedure utilises an important feature of the English language, namely that approximately 50 per cent of it is 'redundant'. Roughly speaking, this means that half of what we say or write is little more than padding. However, it is this that enables us to do crosswords, to understand spoken sentences even though we don't always hear every word, and, more generally, to complete many of the partial messages we receive daily.

For example, if you obliterate all the vowels in the previous sentence and then ask a friend to complete the sentence, I would expect him or her to be able to do it fairly quickly.

The procedure tells the computer to ignore the more redundant letters of the alphabet (most notably, the vowels) and so concentrate on those that uniquely specify the concepts we are looking for.

£10 The top and bottom of Forth stacks

FORTH addicts will no doubt be aware that the standard set in 1979 was superseded by a new one in 1983, which has many subtle differences. Peter Walker, an avid *Acorn User* reader from New Zealand, supplies some practical advice. The most important point is to clarify the status of the return stack throughout with the use of a suitable stack diagram. The following definition of INPUT illustrates the technique. Peter takes up the description...

To make things clear in Forth you have to write out the definitions in great detail – not compactly as the machine would happily accept. You must give a wealth of comment too, but the most important thing is to clarify the behaviour of the stack. (Sometimes the return stack – it holds loop counters – is used and it has to be shown too.) The stack is on the left from top to bottom, followed by words and comments.

Starting from the top then, you can see how each word takes a value or two from the stack, does something and puts a value or two back. INPUT works very like the Basic 'input', and is about as long a definition as one would wish to use. It demonstrates a great deal of Forth such as the use of QUERY, WORD and CONVERT – all difficult to follow from programs – as well as logic functions, a conditional loop, an IF-THEN branch and lots of stack movement.

The beginning is a little tricky. QUERY accepts a string of characters from the keyboard and tucks them away in a very temporary place called the 'terminal input buffer'. For safety during processing, WORD shifts them up to a 'specified delimiter', in this case BL for blank (20 hex), into another place

Beeb Forum is a platform for ideas, tips and applications relating to the BBC micro and the Electron, intended for experienced programmers to share their thoughts. For every reader's tip published we pay £5 – or more for something special. Contributions should be typed or printed, with substantial listings on cassette. WRITE TO Beeb Forum, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

in memory, the word buffer.

A blank is put on the end (the delimiter is now 20 hex regardless), the character count is made first byte (where it gets in our way) and we have something that is beginning to look like a number.

CONVERT needs the address of the first actual digit so we have to step over the count byte and a possible minus sign to get it. You see we have put a couple of values (two bytes each) onto the stack for CONVERT to fill with a double number.

The rest is concerned with testing to see if the input is valid – a point indicates that a double number is implied, not otherwise – and in coping with the possible minus sign (remember it?).

So we end up with either a double number (four bytes) or single on the stack ready for the next word to operate on.

The BEGIN, WHILE REPEAT loop tests a flag on the stack at WHILE and loops back from REPEAT to BEGIN if the flag is true. If it is not true, the WHILE-REPEAT code is skipped and there is no loop.

```
   empty stack...         | : INPUT          start   definition
                          | BEGIN            look below for WHILE and  REPEAT
                          | QUERY   text to terminal input buffer
                          | BL      specified delimiter for WORD is a blank
                       2Ø | WORD  text to word buffer, starts with count byte
                        w | 1+      w is addr of count byte
                      w+1 | DUP     step over count byte
          w+1         w+1 | C@      fetch first character
          w+1           c | 2D      is it a minus ?
          w+1    c     2D | =
          w+1          nf | DUP     negative flag
          w+1    nf    nf | >R      to Return Stack                      nf
          w+1          nf | ABS     if neg, digits start one byte further
          w+1        |nf| |  +
                      ptr | Ø Ø     ptr (pointer) = w+1  or  w+2
          ptr    Ø      Ø | ROT
              Ø Ø     ptr | CONVERT needs a dummy double number to fill and
            n1 n2    addr | C@       returns the addr of next non-numeric ch
 n1  n2                 c | DUP     Now test this next character :
 n1  n2     c           c | BL =    is it a space ?
 n1  n2     c          bf | OVER         (blank-flag)
 n1  n2     c   bf      c | 2E =    is it a point ?
 n1  n2     c   bf     .f | OR            (point-flag)
 n1  n2     c         b.f | OVER
 n1  n2     c   b.f     c | Ø=      is it a null?   (EOL)
 n1  n2     c   b.f    Øf | OR
 n1  n2     c        b.Øf | NOT     if none of these loop back from REPEAT

 n1  n2     c           f | WHILE
 n1  n2     c             | R>      get neg-flag from Return stack
 n1  n2     c          nf | 2DROP 2DROP   ." Not Valid"           clear all
                          | REPEAT                back to the top BEGIN

 n1  n2     c             | R>      get neg-flag from Return stack
 n1  n2     c          nf | IF      if the flag is True,
 n1  n2     c             | >R      put c out of the way
 n1  n2                   | DNEGATE  put a negative onto the double number
 n1  n2                   | R>      get c back
 n1  n2     c             | 2E -    If c is not a "." this result will be
 n1  n2              diff | IF                non-zero, (true)
 n1  n2                   | DROP     - upper byte (most significant)
 n1  n2   or just      n1 | THEN
                          |  ;             end of definition.
```

Stack diagram showing the definition of INPUT which accepts single or double number values from the keyboard



Hey presto no markers

MIKE McNAMARA, from my part of the world in north London, has provided an even easier method of removing markers in *Wordwise*. Mike says . . .

I agree with the solution provided by Martin Wax in February's Forum. However, I have been using the following method for the past two years:

```
*KEY0 !0 !$ !#A !$ !#A
```

To remove the markers from anywhere in the text you press CTRL+SHIFT+f0 together. Hey presto, no markers! The text cursor is positioned at the place of the last marker.



Banishing errors

HATE ERRORS? Perhaps you don't even like REMs? Well, Angus Rodger from Osbaston in Gwent might have come up with a cure . . .

When writing computer programs, I have found it very useful to be able to switch off the BBC micro's error handling. To do this, the user has to enter the following two instructions:

*FX229,1 (Switch off Escape action)
?&202=165 (Change break vector)

This executes any valid instructions normally, but ignores anything which would generate an error message. I have found this very useful in writing programs as remarks can be entered into programs with no REM, eg,

PRINT5+5: This prints sum of five and five

will work correctly.

Finding OSHWM across the Tube

KEITH MILLER of Leighton Buzzard provides some information and a useful function for those with second processors. Keith explains . . .

You may need to know the operating system high water mark (OSHWM) in the I/O processor, for instance when saving the section of memory containing the definitions of ASCII codes 32–196.

The value of OSHWM varies depending on the filing system(s) fitted and if the second processor is not being used it will be simply the value of PAGE as set up by the operating system. However, with the second processor active, PAGE is set at &800, regardless of the filing systems fitted, and so a method is needed to find OSHWM across the Tube.

Both the User Guide and Advanced User Guide document OSBYTE call &83 (131) as a means of reading OSHWM, but when used in the second processor it merely returns the value of PAGE in the second processor (ie, &800). The Advanced User Guide also details OSBYTE &B4 (180), and says that it is equivalent to OSBYTE &83 as far as reading OSHWM is concerned, but this is not the case. With the second processor turned off the two calls indeed return the same result, but when used from within the second processor, OSBYTE &B4 returns the high byte of OSHWM in the I/O processor and this can then be used to save the definitions of ASCII codes 32–196 that lie in the &600 bytes below it, or as a pointer to free memory in the I/O processor. The following function returns the value of OSHWM:

```
1000 DEF FN_ioOSHWM
1010 LOCAL A%,X%,Y%
1020 Y%=&FF:X%=0:A%=&B4
1030 =USR(&FFF4) AND &FF00
```

. . . Does anybody else have anything to pass on about the 6502 second processor?

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PLEASE NOTE FROM 1ST APRIL OUR ADDRESS WILL BE: 55 ORMSIDE WAY, HOLMTHORPE INDUSTRIAL ESTATE, REDHILL, SURREY. TELEPHONE: REDHILL 65080.



Having explored the Beeb's analogue port, Paul Beverley now examines how you can use the ADC for a variety of electrical measurements

TESTING • YOUR RESISTANCE

YOU CAN use the ADC (analogue to digital converter) inputs to measure various electrical quantities – voltage (ac and dc), resistance, capacitance and inductance. Measuring current is not easy, but for most applications, if you are able to measure voltage and resistance, you can calculate the current. I'm going to start with the simplest of all to measure – resistance. I'm also going to look at how we can use the same set-up to provide a way of testing transistors and diodes to see if they are working. It will only provide a 'go/no-go' test, but that is still useful and is simple to set up.

Measuring resistance – the basic principle

The basic principle of operation is to compare the unknown resistance (Rx) with a standard resistor (Rs) of known value. This is done by putting the two resistors in a 'potential divider' circuit (figure 1). The reference voltage which is used for the ADC chip is applied to the top of the divider chain, and the voltage at the middle is measured by applying it to one of the ADC inputs.

You can then work out the value of Rx by using the ratio of the voltages across the two resistors. If you read the ADVAL number (A), this gives a value which represents the voltage across Rs. Since the total voltage, Vref, is represented by the number 65520, the voltage across Rx will be equivalent to (65520 – A). Thus, using simple proportions, we can write:

$$\frac{Rx}{Rs} = \frac{(65520 - A)}{A} = \frac{65520}{A} - 1$$

Thus we can write Rx = Rs*(65520/A – 1). The only problem with this technique is that, for best accuracy, Rs and Rx should be about the same size. To measure a whole range of different values of resistance we need to have various standard resistances available.

There are limits to the values we can use, however. At the lower end we have to be careful not to draw too much current from the voltage reference source, and at the other end, if Rs is too large, we get problems with noise and the effect of the impedance of the ADC input, which is approximately 10 megohms. As a compromise, I suggest using four standard values: 1k, 10k, 100k and 1M.

So how do you implement this? One way is to have the four resistors on a rotary switch, and select whichever is most appropriate for the resistor under test. You then have to indicate to the program which standard resistor is being used so it can make the appropriate calculation. This can be done either by an appropriate key press each time you change ranges, or by having a second set of switch contacts (ie use a two pole, four way switch) and set up a divider chain on ADC channel two so that the computer itself can sense the switch position and automatically change the value of Rs.

An alternative method, and the one I have used (figure 2), is to put all four standard resistors in series with the unknown resistor and then use simple switches to short out one or more of them when the unknown one is too small to be compared with the higher value resistors. This method was chosen as it was the cheapest solution, needing only three push-button switches rather than the more expensive rotary switch. However, the software has been written in a structured way so that if you prefer to use the rotary method, all you need do is to rewrite the 'read_Rs' procedure which detects which buttons are pressed. If you want to use the system to get really high accuracy readings you'll need to use longer averaging times, in which case it might be better to use toggle switches rather than push switches in order to avoid getting a sore thumb, but this would increase the cost again.

Operating the program

You operate the program (listing 1) as follows. When you first run it with an unknown resistor in place (Rx) the value of the resistor is calculated from the simple potential divider formed by Rx and the combination of R1 to R4. If the component under test has a high enough resistance value then you will get a fairly accurate reading just from

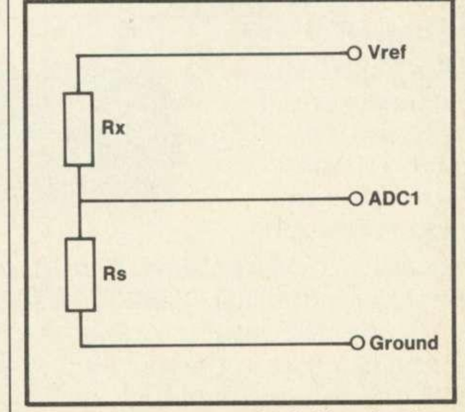


Figure 1. Simple potential divider circuit

the first test. If Rx is below about 120k the program prompts you to press button one. This shorts out R1 leaving the other three resistors to form the potential divider with Rx.

The computer knows you are pressing button one because ADC channel four will give a very low value and so it automatically changes the value of Rs in the calculation. If the resistance is below 25k you are prompted to press button two, and if it's below 5k to press button three. To some extent it does not matter which button you press because the computer always knows which one is pressed and does the calculations accordingly, but for optimum accuracy you should press the button as prompted.

The program uses averaging to improve the accuracy, but at the extremes of the range you will need to use longer averaging times to get the highest precision. Function keys f0 and f1 are programmed to double and halve, respectively, the averaging times. When you first run the program you get one reading each second. Pressing f0 once will double this to two seconds, twice to four seconds and so on. If you use sufficient averaging, say eight or 16 seconds you can even get a good indication of the value of resistance less than 10 ohms. If the averaging time is four seconds or more, a prompt is given at the bottom of the screen to show how the timing of the measurement is proceeding. It counts down in half seconds towards zero.

Setting up and using the system

The precision of the system depends not only on the accuracy of the ADC, but also of the resistance used. There is little point in buying expensive close tolerance resistors, though, as the impedance of the ADC itself will change the effective value of the standard resistance, especially with the 1 megohm resistor. It is best to buy high stability resistors (five per cent tolerance will do) and then, if possible, borrow some close tolerance resistors to calibrate the system. For the highest accuracy it should be calibrated on one particular computer as there is a certain amount of variation of the input impedance of the different ADC chips. The calibration is done by adjusting the values of Rs in lines 280 to 330 of the program. The values given in the listing are the theoretical values of 1k, 11k, 111k and 1111k. The easiest way to do the calibration is to choose an accurately known resistor in each of the four ranges, eg 1 megohm, 100 kilohms, 10 kilohms and 1 kilohm. Start with the 1 megohm and see what value it reads. You then calculate the new value of Rs as:

New value of RS

$$= 1111^{*}\frac{\text{Actual value of Rx}}{\text{Measured value of Rx}}$$

This value can then be entered into lines 280 and 330. If you've got it right, the program should give exactly 1.0000 megohms. You may require a longer averaging time to do an accurate check. You then press button one and use a 100k standard resistor, adjusting line 300, then button two with a 10k resistor, adjusting line 310 and finally a 1k resistor with button three pressed, adjusting the value of Rs in line 320.

With the prototype I found that over

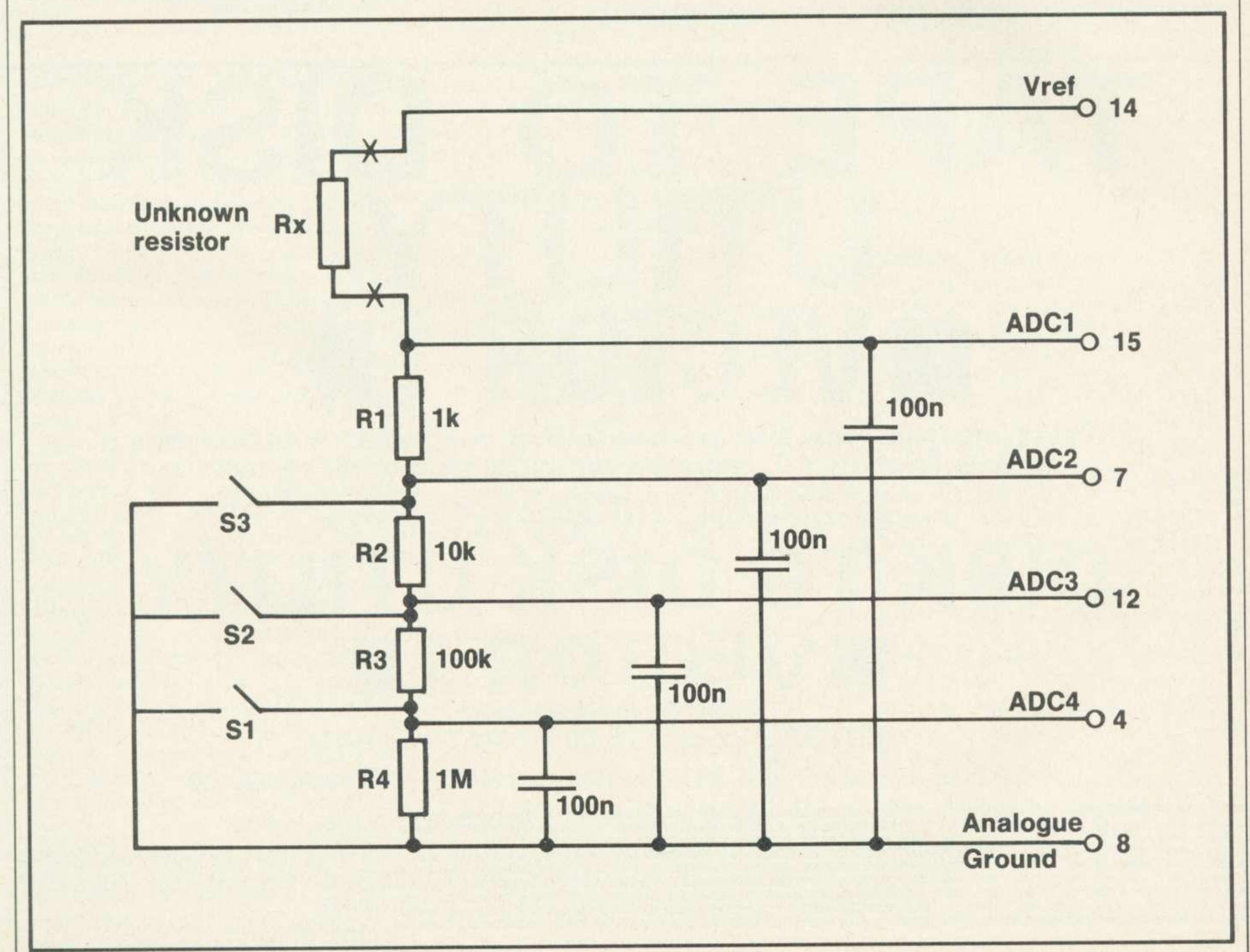


Figure 2. Hardware for semi-automatic resistance measurement

the range 1k to 1 megohm, the measured resistance value was never in error more than 0.3 per cent, and over the range 100 ohms to 10 megohms, it was never worse than two per cent. Below 100 ohms the accuracy decreased, but when a fiddle factor of 0.5 ohms was added (ie +0.0005 at line 80) it appeared to be within two per cent right down to 5 ohms. However, at both extremes of the range, longer averaging times were needed to get a steady enough value.

In case you've not used a resistance meter before, it is important to realise that they are only intended to be used on individual components and not on components within a circuit. If you want to use the system for in-circuit component testing, you must take account of the effect of all the other components in the surrounding circuit, and you should certainly *never* use it on a circuit which is connected to its power supply. Doing so could damage the computer. It is possible to include components which protect the ADC input against over-voltage, but this would make the circuit unnecessarily complicated.

Testing diodes and transistors

Although you cannot talk about the 'resistance' of a diode or a transistor, the resistance measuring system can be used to check whether or not a diode or transistor is functioning properly. The diode can be put in place of the unknown resistor and button three pressed. When it is one way round it should give a high resistance reading (cathode nearest to the Vref connection), while if it is the opposite way its apparent resistance should be substantially lower (roughly 500 to 700 ohms).

For testing NPN transistors you connect the collector and emitter leads to the resistor testing contacts, with the collector at the end nearest Vref. With nothing touching the base, the resistance should be high. If you lick your fingers and hold the collector with one hand and the base with the other, the resistance should drop substantially. For PNP transistors, the same test can be used except that the emitter should be connected nearer to Vref, but again you should make contact with your fingers to the base and the collector. As with the diode tests, this should be done with button three pressed. If you are going to do a number of these tests, it might be better to have a toggle switch instead of this button.

Fully automatic resistance measurement

If you undertake so much resistance checking that you think it worthwhile to have fully automatic operation, you will need to use three relays in place of the push button switches. Reed relays operating off the +5 volt supply would be quite adequate, but you need to control them with lines from either the Printer Port or the User Port. You must also use a transistor driver circuit on each line as the output current from the ports is insufficient even to switch reed relays.

Continuity testing

Any resistance measuring system can be used as a continuity tester, and this is no exception. However, since we are using a programmable system we can easily add features such as sound output so you don't need to look up from the circuit under test. All you have to do is add:

```
675 IF Rx < 10000 THEN VDU7
```

You may also want to change the program to reduce the averaging time in order to get a faster response.

You'll find Paul Beverley's automatic resistance measurement program on yellow page 99.

Detailed program analysis

For those who might want to amend the program for their own applications, here is a detailed analysis.

The main body of the program is an initialisation procedure followed by a repeat loop which consists of choosing the value of Rs according to which buttons are pressed (line 70), calculating the resistance value (line 80), working out which range of values this is in (line 90), printing prompts on the screen about which button to press and which button is actually pressed (line 100), displaying the result (line 110) and then changing the averaging time if requested (line 120). This forms an endless loop and the only way out is to press Escape, and then the system is restored to normal.

PROCinitialise (lines 160 – 250) sets up the error routine (line 170), initialises various variables (lines 180–210), selects all four ADC channels (line 220) ready for the 'read_Rs' procedure, switches off the cursor (line 230), and makes the function keys produce ASCII codes 128 and upwards (line 240).

PROCread_Rs (lines 270 – 350) adjusts the value of Rs in response to which ADC channels are giving a low reading. Line 290 waits for channel four to convert before starting to read the ADVAL values, and line 330 has to be included since, if no resistor is present, all four channels will be giving a low reading, even when no buttons are pressed. Setting Rs back to the maximum value avoids an erroneous 'button pressed' message being printed on the screen. The number of the button pressed is worked out at line 340 by using the LOG function to find in which decade the current value of Rs comes.

FNADC1 (lines 370 – 460) switches to one ADC channel to improve the speed of measurement (line 380) and then reads and averages the ADVAL values for a length of time governed by the variable avetime%, which is the time in half seconds. The purpose of line 410 is to print out a countdown of the time, but it is only used if the averaging time is more than two seconds.

PROCcalc_range (lines 480 – 510) takes the calculated value of Rx and works out which button it would be best to press.

PROCprint_prompts (lines 530 – 600) prints on the screen in double height characters the message as to which button should be pressed and which button actually is.

PROCdisplay_result (lines 620 – 680) first of all gives a bleep to signal the end of the averaging process (line 630), though it only does this for averaging times above two seconds. The value of Rx is turned into a string, and printed out in kilohms, though if it is less than 1 kilohm it is converted into ohms, and if it is greater than or equal to 1 megohm it is changed into megohms.

PROCdprint (X%,Y%,Z$) (lines 700 – 730) simply prints out a string in double height characters starting at a particular screen co-ordinate, and is called by some of the other procedures.

PROCchange_timing (lines 750 – 840) picks up as many presses of keys f0 or f1 as have occurred during the last measurement and doubles or halves the averaging time accordingly. Lines 820 and 830 print out the new averaging time at the bottom of the screen so that the user can see what averaging period has been selected.

PROCerror (lines 860 – 910) restores the normal cursor and the normal use of the function keys as well as reporting any errors.

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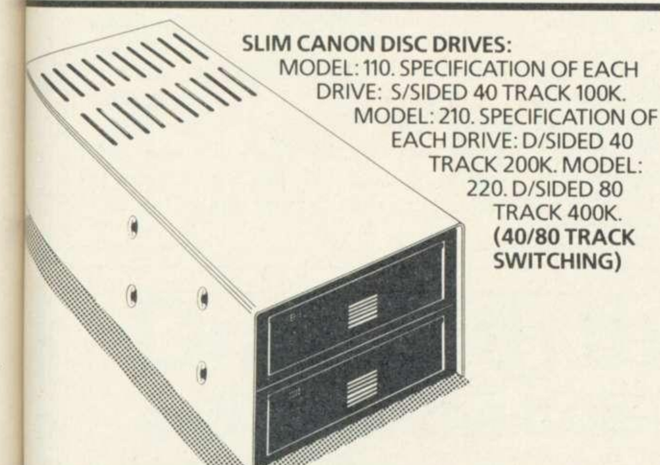
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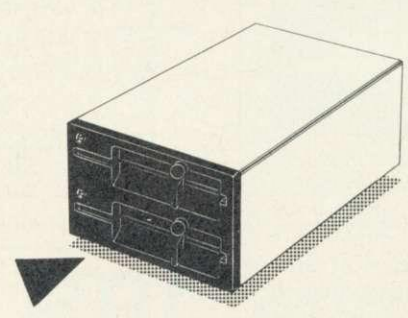
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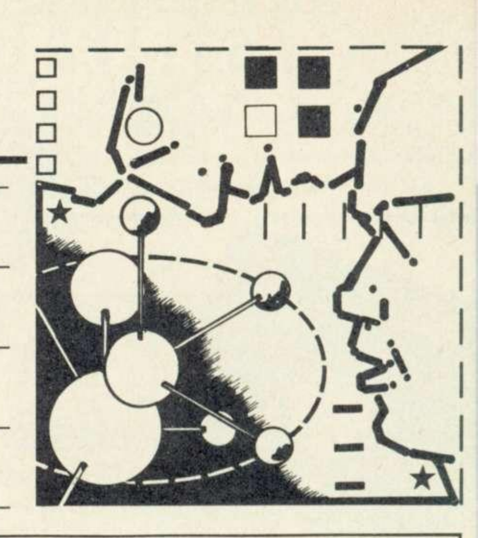
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The pages full of Atomic reactions! This month, your host Mike Barwise explains printer connections and examines the failings of toolkits

HERE we are at the threshold of a new financial year. Software sales trends are ever upwards, and with the introduction of a modicum of standardisation (*Acorn User*, February), which is a pleasant change from the designed-in incompatibility of the recent past, it looks as if this year will see more people using more micros in more homes than ever before.

The eight-bit connection

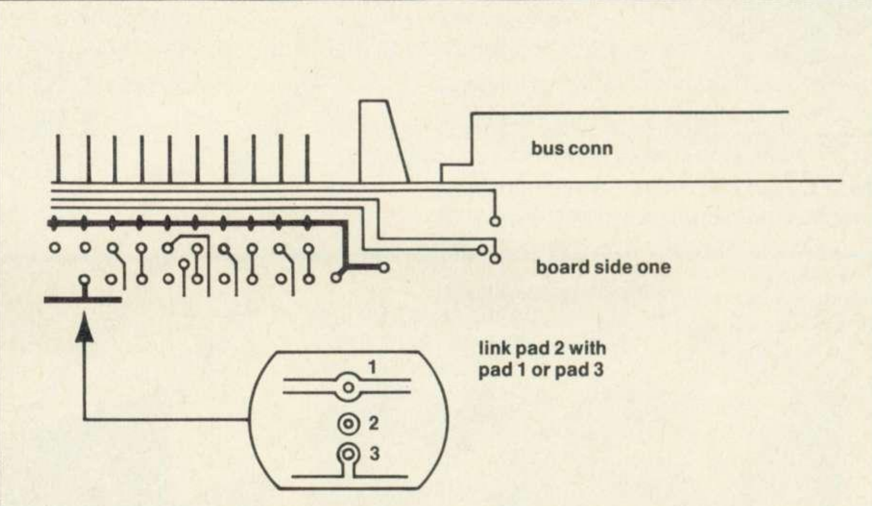
HERE'S an interesting query: how do you connect an eight-bit only printer to the Atom and avoid printing nothing but chunky graphics? It's a question I received from Walter Watson of Stirlingshire and have often heard asked. His printer is a Sony Plotter, but several of the lower cost printers available are eight-bit only as this is BBC micro standard.

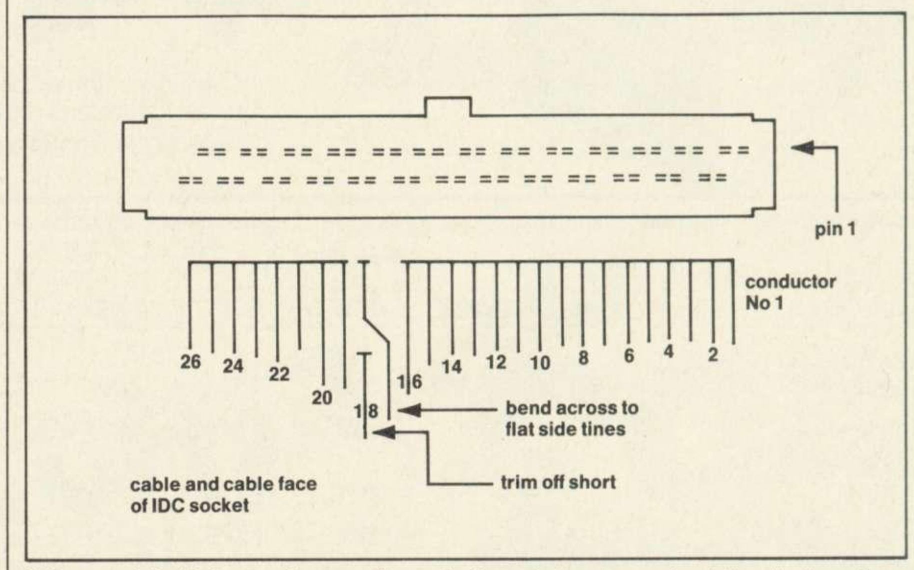
Assuming the printer has a Centronics interface, the eighth data bit (bit eight if the lowest bit is numbered one, or bit seven if the lowest bit is numbered zero) must normally be at logic low to print alphnumerics, and high to print chunky graphics. This eighth bit is connected to pin nine of the printer socket, but is left unconnected at the Atom printer plug. An unconnected logic input normally goes high by default, so just plugging in an eight-bit printer will put it permanently in chunky graphics mode.

The solution, assuming you only want to print text and are prepared to do without chunky graphics altogether, is to write this data line low, and this can be accomplished in two ways.

The simple but almost irrevocable method is to link the inner and outer pins in position nine on the Atom printer plug at the PCB with a fine soldered-in wire (figure 1).

The safer way is to make the connection at one or other end of a special printer lead. If you are using flat cable, you can split out one of the wires (as shown) with a fine modelling knife, and realign it before assembling the *Atom end* connector (figure 2).





Using an eight-bit Centronics: top, figure 1, cheap but permanent solution; bottom, figure 2, the cable answer

When the software writers break the rules

IS IT possible to LINK to and de-LINK from various toolbox ROMs from within Basic, asks R J Parsons of Middlesex. The answer is 'probably not'.

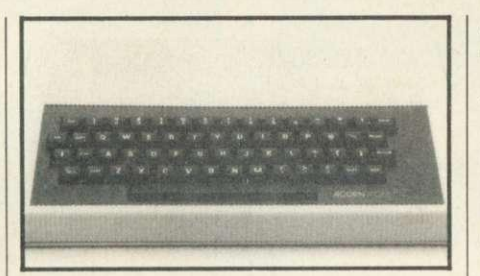
To appreciate the answer to this question properly, you have to understand the process of LINKing into ROMs. The command LINK takes the hex parameter you give it, and treats it as an address to which it performs a machine code JUMP. In passing, the command also loads the accumulator, X and Y registers of the CPU with the values found in the least significant bytes of the variables A, X, Y, but this is largely irrelevant to ROM LINKing.

The significance of the LINK to a ROM, therefore, depends entirely on the machine code routine the CPU finds at the address you LINK to. The com-

mand is only a means of getting there. Unfortunately, there is no standard adhered to by the writers of the extant utilities and toolkits, so without examination of the code at the target address, no assumptions can safely be made about the result of the operation. However, certain generalisations can be made to cover the incompatibility of different extension ROMs.

The LINK command usually changes the Atom OS vectors so that they point to loops of code in the ROM to change the performance of input and output routines, thus modifying keyboard input, screen output, etc. Each ROM will, of course, have its own set of vector changes pointing to its own routines, which will be in the wrong places for other ROMs. The most usual change is the use of the COMVEC to call extra commands. This is a really horrid approach, as it renders the system totally unusable with disc or similar serious expansion. It can be readily identified by the star prefix on the new commands.

Most utility ROMs use Page Zero fairly liberally and randomly, for tasks as simple as storing interim values from arithmetic and logical operations;



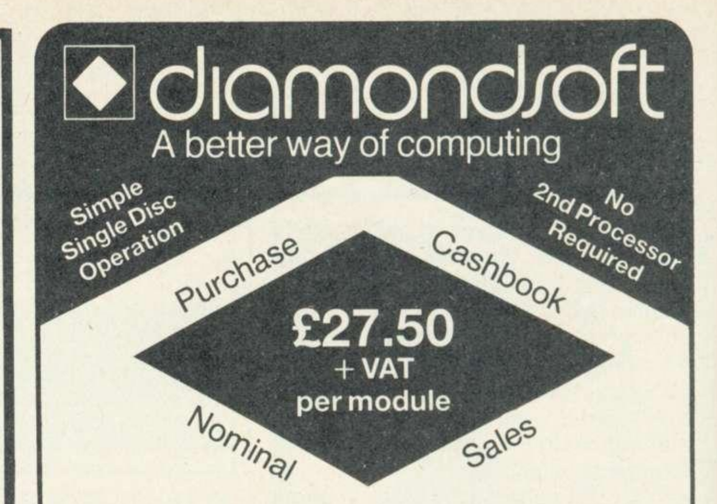
as flag locations for tests; and in some cases even for volatile code blocks. As there are only some 100 or so user bytes in Page Zero anyway, and there is no consistency about allocation, various ROMs will probably use the same location for different purposes, creating conflicts.

Unless you are prepared to provide your own vector reset routine, either in machine code or by laboriously POKEing all the values into the vector table at Page 02, the only way to restore the default vectors is via the reset routine at &FF3F, which also stops your Basic cold!

The ideal toolkit would have at least the following features. An EXIT command which restores all vectors and locations used to their original values before returning you to Basic. Use of Page Zero restricted to the absolutely essential (eg, STA(IND),Y), temporary byte storage being located elsewhere. A command interpreter obeying the Atom OS protocol for A000 ROMs, ie, 40BF in A000, A001 followed by the first instruction of the code. You would then not need the LINK command anyway.

Unfortunately, none of the utilities I have seen incorporate all these features, and only one has the last. Although the answer to Mr Parsons' question is unfortunately 'probably not', it's not the poor Atom's fault, but that of independent software writers who did not stick to the rules laid down by the Atom's designers.

Invented a routine or discovered a hardware modification for the Atom? Here's a chance to show your originality and win some cash. Send your idea to: Atom Forum, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.


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Business computers miss release dates

ACORN looks likely to revise its range of business computers in light of the recent deal with Olivetti. However, statements from the various parts of the company are confused.

Alex Reid was unavailable to talk to *Acorn User*, and even the head of the business section was unable to comment. Statements about specific products were impossible to get as the whole company was in a 'melting pot' with even Olivetti not expanding on its original financial statements.

Acorn's plans (announced in a Press release in early February) to have the machines in 50 stores by the time this magazine came out have obviously been shelved.



ABC with Winchester

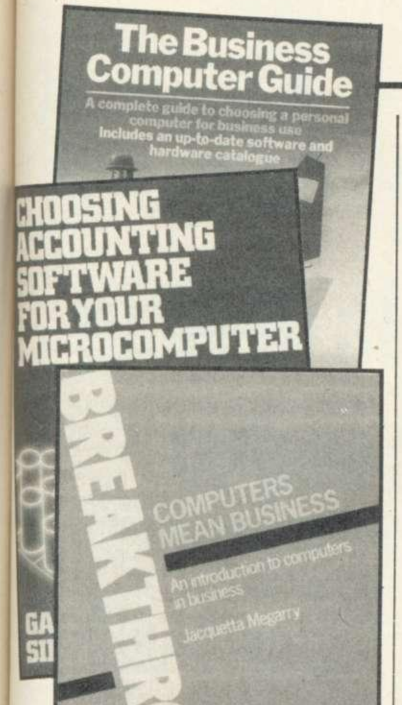
Customer services could not give the address of any dealer stocking the machines as we went to press. However, Acorn's London office said the Personal Assistant and the 300 series were still planned to be on display at the end of March.

Olivetti's strength is in business computers and it will obviously have its own opinions on the ABCs. The ABC300 machines are as advanced as anything on the market with IBM compatibility and running the latest GEM operating system.

All the computers can be upgraded to ABC310 level (except the Terminal), and prices were released in January from £800 and £4000. The 32016 (ABC200) version running Unix and targeted at universities has not been released, in fact the second processor is not yet available for the BBC.

For details phone Acorn customer services on (0223) 210111.

Micro	Chip	Software included	Disc	£+VAT
Terminal	8-bit	Terminal emulators	—	799
PA	8-bit	View, Viewsheet	twin	999
ABC100	8-bit	CP/M, Plan series	twin	1,599
ABC110		as 100 but with Winchester hard disc		2,999
ABC300	16-bit	PC-DOS, MS-DOS, CP/M86	twin	2,599
ABC310		as 300 but with Winchester and GEM		3,999



Trio of books for newcomers

THREE books to help newcomers to the business side of computers will, if the blurb on the covers is to be believed, solve all your problems.

In the first, *The Business Computer Guide* from Sunshine, Horenstein and Tarlin will lead you 'step-by-step through the maze of hardware and software' for £8.95. Gary Simon in *Choosing Accounting Software for your Microcomputer* from Collins, will explain 'which accounting package is best for you' for £7.95.

The third, *Computers mean Business* from Pan will 'show how computers can increase profitability and efficiency' for £2.95. Here, your guide is Jacquetta Megarry.

Both Sunshine and Collins have a gimmick: for one it's an up-to-date software and hardware catalogue, and the other a rapid checker to help decide the best money-handling package.

Megarry's book is linked to the National Extension College's home study courses and designed to cover several educational syllabuses.

All three take CP/M as the standard system, and although one was written using a BBC micro, you'll be lucky to find any mention of BBC packages. In fact, the up-to-date guide doesn't even list Acorn, but then it was written by Americans with sections reworked for the UK version.

Four additions to database line-up

MORE databases have appeared since our round-up and comparison in the December issue. Four new ones cover the BBC and Electron, with versions on disc, cassette and EPROM.

Sigma produces versions of its *Psifile* for the BBC on disc or cassette, and the Electron on cassette. The packaging does warn buyers to check they have the right version, but it doesn't say anywhere whether it's 40 or 80 track (our version booted up on a 40-track drive). It costs £19.95.

Discdata from Watford is available in either format and costs £19.55. It stresses ease of use and a menu system, and includes the ability to perform calculations on numeric fields.

Fileaid is next on the list from Lincoln Microsystems. For £35 you get an EPROM and disc of utilities. Yet again, however, the disc format was not mentioned on the packaging, although the adverts do check which version you want.

Another offering from Watford is *File Plus* on EPROM at £49.45.

This also comes with a utilities disc, and boasts its own command language for searching. Statistics can be manipulated with the arithmetic operators provided.

Revision

Finally, an almost-new database. The Starbase EPROM from GCC (reviewed last July) has been upgraded and renamed: it's now called *Stardatabase*. The final revision is the price – £86.25, which includes a 40/80-track disc full of software.

Disc software for mailing and payroll

MAIL Merge enables wordprocessor users to add a disc-full of names and addresses to standard letters produced on either *Wordwise* or *Scribe Merlin* products.

The 40-track disc costs £19.95, and either 350 or 700 names can be stored on a 'merge' disc, depending on format.

Another product from CYB is *Payroll* for firms with 150 or 600 employees, again depending on disc format. National insurance, tax and fixed deductions are all calculated as well as a coin and note analysis. The disc costs £49.95.

CYB encourages correspondence and prints a contact telephone number for each system. Details from CYB at 8 Briar Ave, Norbury, London SW16 3AA.

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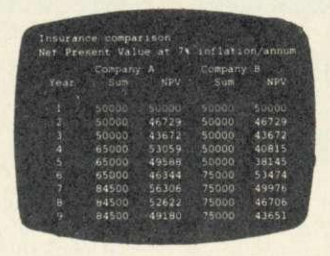
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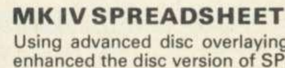


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4	65000	53059	50000	40815
5	65000	49588	50000	38145
6	65000	46344	75000	53474
7	84500	56306	75000	49976
8	84500	52622	75000	46706
9	84500	49180	75000	43651

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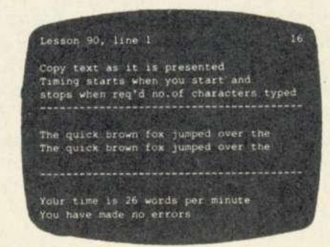
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MU4

School business centre seeks industry links

LIAISON between industry, business and schools is the aim of the Centre for Industrial Studies at the King's School in Grantham, Lincolnshire.

The project was originally the idea of the headmaster Derek Lee and already the school has attracted funding from the Department of Trade and Industry, county council and Leverhulme Trust, among others.

From October, an industrialist and assistant will be employed full-time at the school to advise on the scheme and help with lessons. These two posts have yet to be filled, but it is planned to make the salary attractive enough to tempt people from local firms.

Derek Vaughan, one of the organisers, explained: 'We hope to act as a resource centre for the whole area, and to develop links with other schools.

'Companies will be invited to come into the school to give advice. If they give monetary back-up that would be super, but it's a secondary feature.

'They could help in geography for example, where the reasons why a firm came to this area are important, or in economics where they could give a fund of information.'

King's School is already working with the local electricity company on developing a teaching package.

For details contact CIS, The King's School, Grantham, Lincolnshire. Tel: (0476) 63180.

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SMALL businesses which need their accounts sorted out without resorting to a dozen discs could take a look at Integrated Accounting from Diamondsoft.

For £125 plus VAT, it provides on one disc a cashbook, ledgers, VAT and cash flow analysis. A disc drive (40 or 80-track) and printer are needed.

The manual was produced using an Epson, and although pages aren't numbered or indexed, system updates and additions are mentioned, so hopefully these omissions will be among the first few.



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KEYPADS were developed to save time entering numerical data, and this one has the added advantage that it takes up none of the BBC micro's precious RAM.

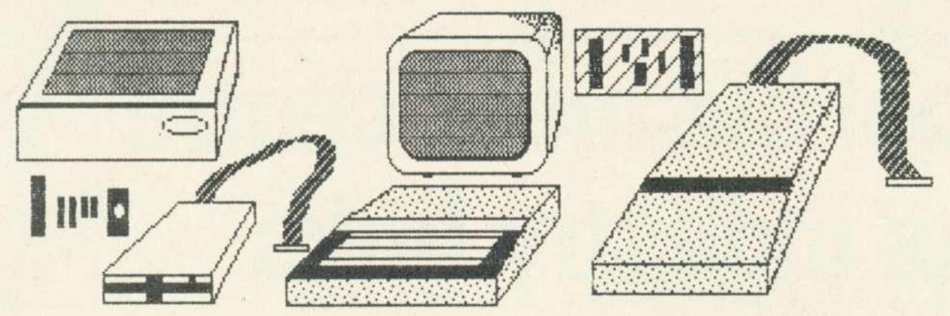
The makers claim it is compatible with all commercial software, and, because it connects in parallel with the main keyboard, doesn't use up any interface ports.

The pad contains decimal point, 0 to 9 and return keys.

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MAKING THE MOST OF CP/M

In the first of a series of articles aimed at ABC business micro users Edward Brown explains how CP/M works

ACORN is putting itself firmly in the business computer field with the introduction of the ABC range. The ABC100 and ABC110 are Z80-based and, like the Z80 second processor, come supplied with CP/M 2.2 and a bundle of business software (table 1). This series of articles will introduce you to CP/M (Control Program for Microprocessors) on these Z80-based Acorn machines and explain how to use them to full advantage. I shall refer to CP/M 2.2 as CP/M-80 and to the ABC100/110 and BBC micro with Z80 second processor as the Acorn machines, throughout.

Why CP/M-80?

CP/M was one of the first microcomputer operating systems written to handle floppy discs and version 2.2 has become the accepted operating system for business and is now used on hundreds of machines. Due to this wide acceptance of CP/M-80 thousands of software packages are available covering almost every conceivable application, and so there is a comprehensive range of 'off the shelf' software. Many packages are also available in the public domain and can be obtained for little or no cost. (Public domain software is freely available for anyone to use as they wish.) Some of these are excellent and I'll be looking at these in the future. In this country, the CP/M User Group UK (72 Mill Road, Hawley, Dartford, Kent DA2 7RZ) can supply public domain software from its library of over 200 discs for approximately £4 per disc – the charge is to cover costs.

This vast range of software has become available because a program written for CP/M-80 can be taken from a CP/M-80 environment on one computer and run in the same environment on another. It is this portability that makes CP/M-80 so popular.

What is CP/M-80?

CP/M-80 is a control program or operating system which manages the resources (printer, disc, etc) of the micro and provides a standard interface for software written to run on any CP/M-80 machine. Unlike the MOS (Machine Operating System) of the BBC micro, which is ROM-based, CP/M-80 is a disc-based operating system. This means that every time one of the Acorn machines is turned on or rese,t CP/M-80 has to be read into the memory used by the Z80 processor from the system tracks of the disc. This procedure is known as 'booting' or 'bootstrap loading' and is carried out by a ROM in the Z80 memory.

Once this ROM has loaded CP/M-80 into the Z80 memory, it then controls the machine and provides the same sort of facilities as the BBC MOS in that it gives a disc filing system and controls the peripherals, such as keyboard, screen, printer and disc drives.

Portability

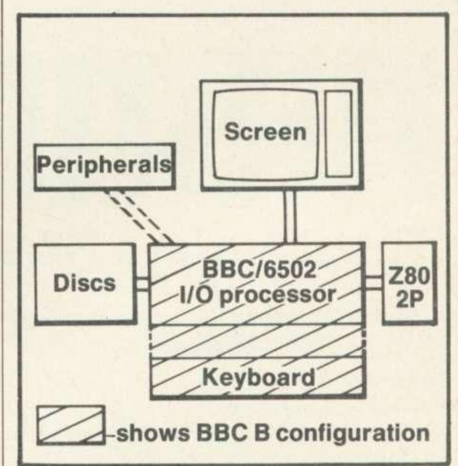
CP/M-80 is logically divided into three distinct parts:

- CCP – Console Command Processor
- BDOS – Basic Disc Operating System
- BIOS – Basic Input Output System

The CCP and BDOS are hardware independent and remain the same for CP/M-80 on all machines. The BDOS provides high level commands such as those for reading and writing of strings and file manipulation. The BIOS is hardware dependent and provides the input and output primitives (the lowest level of I/O) for reading and writing to the peripherals.

Access to the individual routines is through a hardware independent jump table (list of entry points) at the start of the BIOS. The BIOS jump table together with the CCP and BDOS provide a standard interface which is the same for all CP/M-80 based systems. For example, a call to the fourth entry point in the BIOS jump table will return a seven-bit ASCII character from the keyboard on all CP/M-80 systems. However, the actual process involved in getting the character from the keyboard will be different in each machine. Most read the character directly from the hardware but on the Acorn machines the character is passed from the BBC, which acts as an I/O processor, via the Tube to the BIOS in the Z80. So, regardless of the physical implementation of the BIOS, the logical interface with CP/M-80 remains static and provides the necessary portability.

Although software written to run on one CP/M-80 machine will run on any



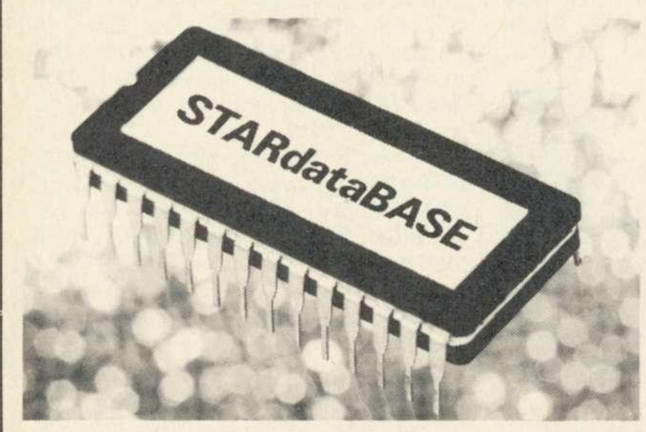
The CP/M set-up for the BBC micro

other there are problems in transferring data between them by disc. The most obvious cause is the use of various sizes and densities of disc.

One of the easiest ways to overcome this is to use a communications package (such as the commercially available BSTAM from Acornsoft or the public domain UKM7 from CP/MUGUK) to transfer data and programs between machines using the RS423 serial port. This method also allows you to do this between remote machines via the telephone network. As Acorn machines are popular, most suppliers of software will provide programs on Acorn format discs. The standard format between all Acorn machines is single density and

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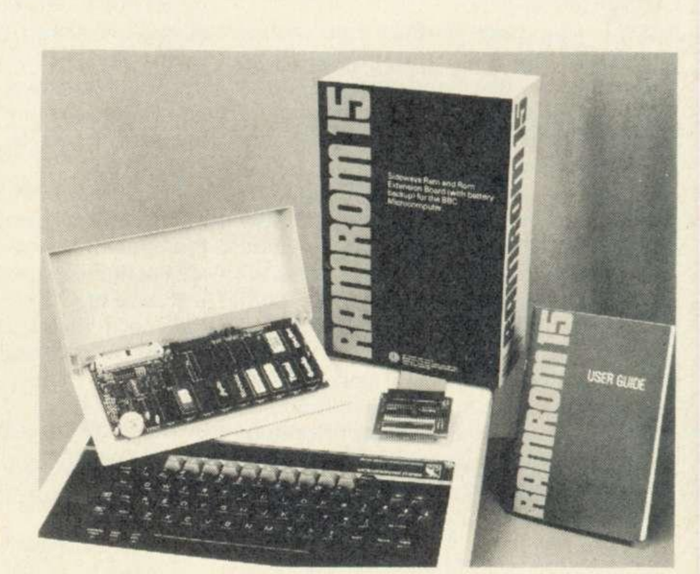
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the ABCs can read and write this as well as the double density format.

CP/M-80 on the Acorn machines

All three Acorn machines share the same basic layout (figure 1). Each has a 6502 I/O processor and memory, a Z80 processor and memory, a screen, a keyboard and disc drives. In the Z80 second processor configuration the keyboard and 6502 I/O processor are provided by the BBC micro. Other peripherals such as printers, plotters and modems can be attached as required. Although the basic layout is the same there are differences (tables 1 and 2).

The 6502 I/O processor contains a MOS which provides all the OS commands and VDU codes available on the BBC micro. These can be used in addition to the standard facilities of CP/M-80, and provides a very flexible method of temporarily setting up the machine for a special use such as a serial printer or slow baud rate for communications. For more permanent facilities, such as always selecting a serial printer, Acorn have provided a patch area in the BIOS – I'll show you how to install patches in a future article.

Both CP/M-80 and the 6502 MOS provide facilities to redirect input and output through different devices and mixing these can cause unexpected results – one of the drawbacks of such a flexible system. It's best, wherever possible, to use the facilities provided by CP/M-80.

Booting CP/M-80

I'll look briefly at the different ways of booting CP/M-80. On the Acorn machines there are three options: turning the machine on, pressing the CTRL and Break keys together, and pressing the Break key by itself. On the ABCs the Break key is at the back of the keyboard in a position where it can't be pressed accidentally.

Turning the machine on and pressing CTRL Break have the same effect in that they reset the machine to the default state and boot CP/M-80 from disc. Pressing Break by itself produces a * prompt and then any of the 'star' commands can be entered. When ready to boot CP/M-80, one of the additional commands (CPM or WCPM) is entered to boot from the disc or Winchester hard disc respectively and control is passed to the ROM in the Z80 processor memory.

This ROM contains code for making MOS calls via the Tube and the bootstrap code for loading CP/M-80 into memory. The code for making MOS calls is copied to the top of memory and then CP/M-80 is read from disc and the ROM is switched out of the Z80 memory space. If the ROM was entered by the CPM command it tries to boot from the disc. If it was entered by the WCPM command, power on, or CTRL Break, it tries to boot from the Winchester and if this is not successful, it then tries the disc.

The Console Command Processor (CCP)

When CP/M-80 boots up it defaults to drive A and prompts for input: A>. While CP/M-80 is waiting for input certain control characters have a special effect and these are summarised in table 3. The most important is CTRL C which, when typed as the first character after the prompt, performs a warm boot of CP/M-80, ie, the CCP and BDOS parts of CP/M-80 are re-read into memory from the disc. This is done so that applications programs running in the Transient Programming Area (user's Basic program area on the BBC micro) can use the space occupied by the CCP and BDOS. Most applications, however, do not use the memory occupied by the BDOS. It is necessary to type a CTRL C before accessing a

```
A>DIR
A: MOVCPM   COM : GSX      SYS : DDFXHR8  PRL : DDFXLR8  PRL
A: DDFXLR7  PRL : DDOKI84  PRL : ASSIGN   SYS : DDBBC0   PRL
A: DDBBC1   PRL : MALLARD  COM : UNLIST   COM : CONVERT  COM
A: PREPARE  COM : MEMO     OVL : READDFS  BBC : 6502-Z80 BBC
A: MEMO     COM : VERIFY   BBC : ACTIONS  DEF : MEMOHELP TXT
A: MERGE    BBC : CONFIG   COM : RECOVER  COM : CRC      COM
A: CRCKLIST CRC : COPY     COM : FORMAT   COM : VERIFY   COM
A: TERM     COM : BBCBASIC COM : DDT      COM : STAT     COM
A: ED       COM : MEMOP    COM : XSUB     COM : MPP      OVL
A: CONFIG   DAT : SORT     BBC : ASM      COM : SUBMIT   COM
A: STAR     COM : SYSGEN   COM : PIP      COM : DUMP     COM
A: LOAD     COM : DIP      COM : GENGRAF  COM : FORMPREP COM
A: MEMO     SWP :              $$$
```

The catalogue produced by a CP/M file

	Z80	ABC100	ABC110
Processors	Z80/6502	Z80/6502	Z80/6502
Floppy disc	2 × 400k	2 × 720k	1 × 720k
Hard disc	no	no	1 × 10Mb
Screen	Monochrome or colour	Monochrome	Colour
Software available	CP/M-80, GSX, MemoPlan, FilePlan, GraphPlan, Accountant, Nucleus, BBC Basic, Professional Basic, CIS Cobol	CP/M-80, GSX, MemoPlan*, FilePlan, MicroPlan†	CP/M-80, GSX, MemoPlan*, FilePlan, MicroPlan†

**MemoPlan on the ABCs includes a full configuration program*
†MicroPlan includes GraphPlan

Table 1. Comparing the Z80, ABC100 and ABC110

Mixture	**Hard** one		**Hard** two		**Double Density** Floppy		**Single Density** Floppy		
2W+2DDF	A	B	C	D	E	F	G	H	
2W+1DDF	A	B	C	D	E	–	G	–	
2W+2SDF	A	B	C	D	–	–	G	H	
2W+1SDF	A	B	C	D	–	–	G	–	
1W+2DDF	A	B	–	–	E	F	G	H	
1W+1DDF	A	B	–	–	E	–	G	–	ABC110
1W+2SDF	A	B	–	–	–	–	G	H	
1W+1SDF	A	B	–	–	–	–	G	–	
0W+2DDF	–	–	–	–	A	B	C	D	ABC100
0W+2SDF	–	–	–	–	–	–	A	B	BBC+Z80

NOTE Double density drives can be used for both double density and single density

KEY

The letters A to H refer to the eight possible disc drive designations. Thus the BBC+Z80 has two possible disc drives, configured as A and B. The key to the Mixture column is: W=Winchester, DDF=Double Density Floppy, SDF=Single Density Floppy. Thus 1W+1DDF is read as 'One Winchester with one double density floppy'.

Table 2. Possible CPM disc drive configurations

changed disc otherwise the disc becomes read only. The CTRL C causes the disc to be logged in by reading the disc directory (catalogue) to create a map of the sectors used and a check byte to protect against the disc being changed without a CTRL C being typed.

Command Types

There are two types of command in CP/M-80 – built-in and transient. The CCP will take the input and test to see if it is a built-in command and, if so, execute it. If it is not, it will accèss the disc to see if it is a transient command and carry it out if it is. If it is neither it re-displays the input followed by a question mark and re-prompts for input.

Built-in Commands

I'll now look at these built-in commands in more detail, give an example of each and the nearest BBC DFS equivalent. These are shown in table 4.

: As the first character of a line this instructs the CCP to ignore that line. This is not of use when typing from the keyboard but is of great help when a file of commands is created and later run using SUBMIT, eg, :THIS IS A COMMENT LINE IGNORED BY THE CCP.

d: Selects drive d as the default drive. All subsequent commands that do not specify a drive will use drive d. CP/M-80 allows up to 16 drives but only eight are used on the Acorn machines (table 2). For example, B: will log in drive B and the CCP prompt will become B>.

CTRL C	At start of line causes warm boot
CTRL E	Physical end of line, line sent on return
CTRL H	Backspace one character position
CTRL J	End of line input, line feed
CTRL M	End of line input, carriage return
CTRL P	Echo displayed characters to printer
CTRL R	Re-display current line
CTRL S	Pause display, resumed by any character
CTRL U	Delete the current line
CTRL X	Delete the current line
DEL	Deletes the last character typed

Table 3. CP/M-80 control characters

USER <n> Selects a different user number for subsequent commands. There can be up to 16 user numbers allowing each drive to be split into independent areas. Files in one user area cannot be seen from others. The default user area is zero eg, USER 5 will select user area five for all subsequent disc accesses.

All the remaining built-in commands require a file reference, which in CP/M-80 consists of a file name and a file extension separated by a dot. File references can be made ambiguous by including the wildcard characters * and ? in any position. ? means that any character will do and * means that a range of characters will do. The wildcards ? and * correspond to the wildcards # and * in the Acorn DFS. A file reference with one or more of thèse characters in it is called an Ambiguous FileName <afn>. Other file references are called Unambiguous FileNames <ufn>. Both <ufn>s and <afn>s can optionally be preceded by a drive specification of the form d: where d is the drive letter. See table 5 for examples of file names.

ERA <afn> or **ERA <ufn>** will erase the files specified from the directory of the drive named. If no drive is specified, the currently selected default drive is used. If *.* is typed as the <afn>, the CCP will prompt ALL FILES (Y/N)? and will only delete the files if Y is typed in response, eg, ERA*.PRN will erase all files with the extension PRN.

DIR <afn> or **<ufn>** will produce a display of the file references that occur on the specified drive. The command DIR without an <afn> or <ufn> can be used to get a display of all files on the currently selected default drive, eg, DIR B:*. PRN will display a list of file references for all files with the extension PRN on drive B.

REN <ufn1> = <ufn2> will rename the file <ufn2> with the name <ufn1>. Both <ufn1> and <ufn2> must be on the same drive. If a drive name is specified then it must be the same for both drives, eg, REN B:TEST.OLD= B:TEST.TXT will rename the file TEST.TXT on drive B as TEST.OLD.

SAVE <n> <ufn> will save <n> pages of 256 bytes starting at location 100H to the file specified by <ufn>, eg, SAVE 4ONEK.FIL will save 1k of memory starting at location 100H to the file ONEK.FIL on the currently selected default drive.

CP/M-80	BBC
:	REM
B:	*MOUNT†
USER	*DIR
ERA	*DESTROY
DIR	*CAT
REN	*RENAME
SAVE	*SAVE
TYPE	LIST

Note the difference between DIR on CP/M and *DIR on BBC

†MOUNT is available on the Advanced Disc Filing System only

Table 4. The nearest BBC DFS equivalent to built-in commands

ASM	Intel 8080 assembler source code
HEX	Intel hexadecimal format file for load utility
COM	Computer executable file, run by typing name without extension
BAS	Professional Basic source code, can be tokens or ASCII
BBC	BBC Basic source code
TXT	Text file
DAT	Data file
SWP	Temporary file used by *MemoPlan* for storing text being edited
$$$	Temporary file created by various programs when running, should be deleted
PRN	Print file
SYS	Files used by the GSX system for control
PRL	Device drivers for GSX
OVL	Overlay files for programs larger than the memory available, these can be loaded in by the main program
TBL	Table from the *GraphPlan* package
CHT	Chart from the *GraphPlan* package
#DF	Worksheet from *FilePlan*
CBL	Cobol source file
F$$	Print file from *MemoPlan*
T$$	Print spool file from *MemoPlan*
BAK	Backup file created by *MemoPlan* and other programs

Table 5. Examples of file extensions

TYPE <ufn> will display the contents of the file specified on the screen, eg, TYPE B:TEST.TXT will display the contents of the file TEXT.TXT on drive B.

Transient Commands

A transient command is any computer-executable file with the extent COM. There are several such commands for the Acorn machines, such as FORMAT, VERIFY, COPY and PREPARE, as well as the standard CP/M-80 transient commands, such as STAT, PIP and DUMP.

These transient commands are applications programs loaded from disc into the Transient Program Area starting at location 100H and then run. All programs written to run under CP/M-80 should start at location 100H, as below this is the Base Page where the system variables are kept by CP/M-80.

The Catalogue

The catalogue produced by a CP/M file looks awesome at first sight. However, the information provided when you page 139 ▶

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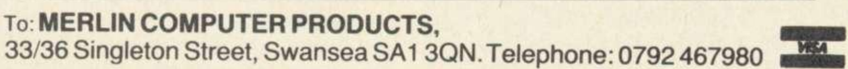
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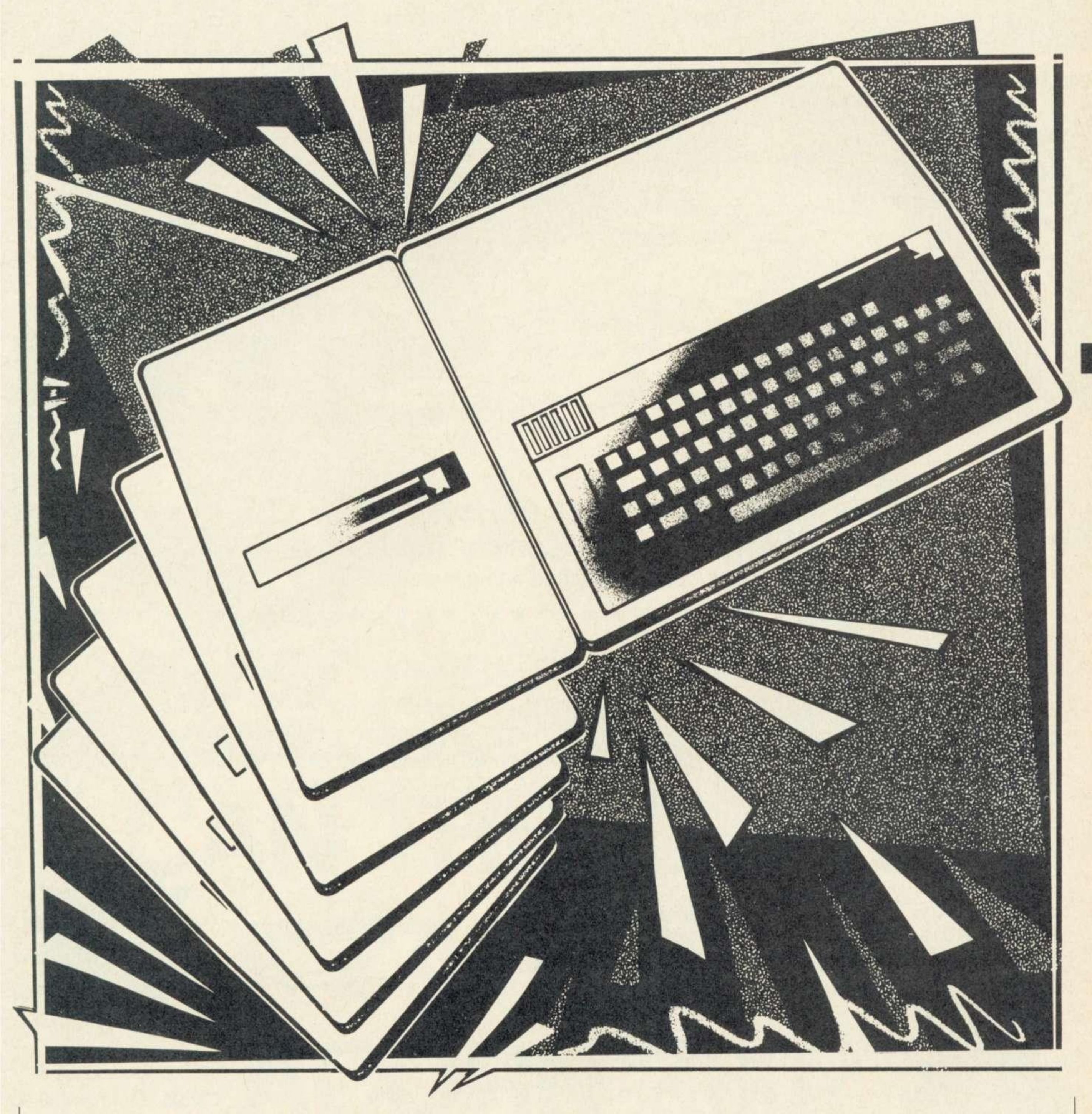
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◀ page 136

type DIR not only details the file names but also what types of file they are.

The row of As down the left hand side show that you are logged onto drive A, and thus each of the files detailed is contained on the disc in that drive.

The rest of the catalogue is divided into four columns each separated by a colon.

Each file reference is contained between the columns of colons, eg, MOVCPM COM. Each file reference consists of two parts, the file name and the file extension. The former is straightforward as it is the name of the file. The latter tells you what type of file it is. In the example above, MOVCPM is the file name and COM is the file extension.

In this case MOVCPM is a program that will allow CPM to be MOVed. COM is shorthand for computer executable file, and means that when MOVCPM is typed in it will cause this file to be executed, rather as *EXEC would work on a *SPOOLed Basic file.

There are many different types of file extensions. Table 5 on page 136 contains a list of some of the more useful extensions, with brief descriptions of what they do.

In forthcoming issues of *Acorn User* Edward Brown and Richard Clement will be answering your questions about CP/M and presenting your tips and their own. They are both system designers and consultants, committee members of the Chiltern Branch of the CP/MUG (UK) and are working on a book about CP/M on the BBC micro.

Edward has installed CP/M on several machines and been closely involved with the integration and testing of multi-tasking and real-time software. Richard has designed and built a commercial CP/M based micro and has been involved with software development for multi-tasking operating systems.

So if you've got any problems or hints for CP/M users send them to CP/M Corner, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

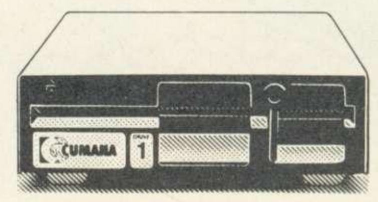
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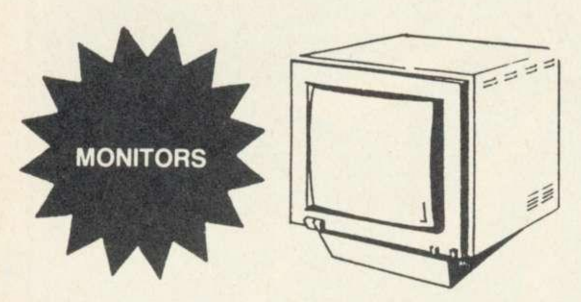




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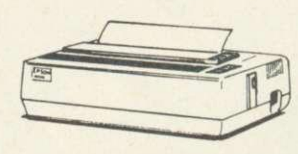
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CAN THE ZEP 100 ZAP THE ACORN Z80?

Simon Williams analyses a contender in the Z80 market

IF YOU intend to use your BBC micro for business work, you may well consider expanding the basic machine with a Z80 processor. This not only gives you an additional 64k of memory, but access to the CP/M operating system and a large range of software written for a variety of machines.

Your first thought may be to buy Acorn's Z80 second processor which, together with its associated software, was reviewed extensively in the June to September '84 issues of *Acorn User*. There's an alternative, however, and one that has been around in various guises for much longer. Torch Computers brought out a dual disc pack, complete with Z80 processor, soon after the release of the Beeb, and more recently the company has started to sell the Z80 board separately under the name Zep 100.

This unit comes complete with four pieces of packaged software and an operating system ROM called MCP (shades of the film *Tron*). It will cost you £299, a hundred pounds cheaper than the Acorn product. You'll need a dual disc drive to run with the micro, and you will then have a pretty powerful business system.

The Zep 100 is a Eurocard circuit board mounted with the processor, extra memory and other ancillary chips. A short length of ribbon cable is attached to one end and this terminates with a plug that connects to the Tube socket on the main BBC micro circuit board. The Z80 board is fixed to the

inside of the micro's case by means of three self-adhesive plastic clips. The best way of positioning it is to slide the clips onto it and connect the cable to the Tube socket; you can then decide on its final position before sticking the pads to the top of the case. Once it's fitted, you have to take care when lifting the lid off your micro, as this is now attached to the bottom by the Zep 100 cable.

Although the installation is a bit fiddly, the final arrangement is satisfactory and means that your micro is still contained in one unit. The only other attachment to the micro is the insertion of the MCP chip. This takes over the MOS functions of your micro at switch-on and provides a CP/M-compatible environment for the software to work in. You'll still need an Acorn disc interface, and you can switch back to run standard Beeb software by performing a B-Break break (holding the 'B' key down while pressing Break, and then pressing Break on its own).

The MCP provides quite a few functions of its own, and these are documented in the Zep 100 user guide. This is the thinnest of the five manuals supplied with the package, and details each of the functions on a separate page, giving examples of syntax. The built-in functions include copying Torch-format discs, handling the screen display (changing colours, etc) and printing the time from the real-time clock.

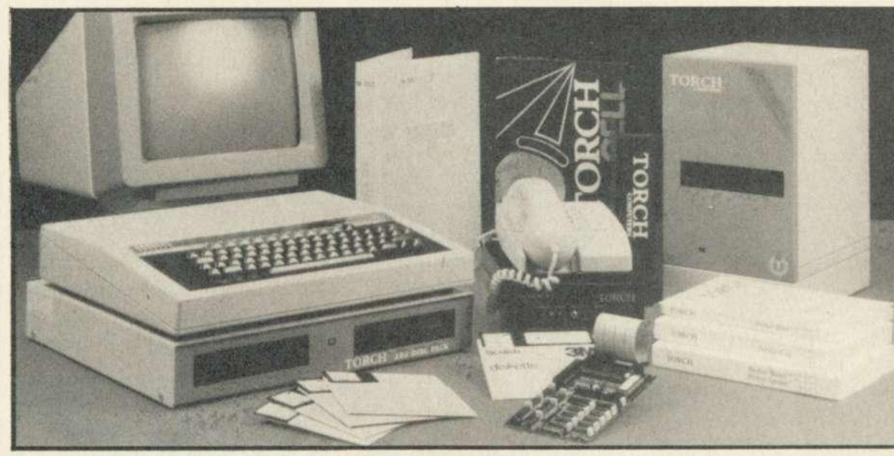
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This manual also covers the utilities supplied separately on disc, and these include a font generator, a monitor, an RS423 comms routine, disc-map utilities and a music editor. Three excellent music files are included on the disc and the music editor represents one of the few attempts I've heard to put feeling into a micro-generated tune. I've tried most of the utilities and they seem commendably versatile and reasonably robust. The manual could offer a bit more detail of some of them, however.

The three business software packages supplied with the Zep 100 are produced by the Perfect Software Corporation of the US. With names like *Perfect Writer*, *Perfect Filer* and *Perfect Calc* they really are asking for it, but the



The alternative Z80: Torch's Zep 100 plus dual disc pack and business software packages

ACORN AND TORCH SYSTEMS COMPARED

	Prices (inc VAT)	Bundled software	Additional products
Zep 100	£343.85	Perfect Writer, Perfect Filer, Perfect Calc, Z80 Basic	Unicorn hardware range Range of Torch formatted software
ZDP 240 (Zep 100 plus Torch twin floppy disc pack)	£803.85		
Acorn Z80	£399.00	FilePlan, GraphPlan, MemoPlan, Accountant, Nucleus, CIS Cobol, professional Basic, Z80 Basic	Range of Acorn formatted software
Acorn Z80 plus BBC disc pack	£868.00		

packages, while not living up to their names, are certainly high-quality products. *Perfect Writer* distinguishes itself by coming complete with its own spelling checker – yes, *Perfect Speller*. This wordprocessor is a sophisticated beast and, as with most things sophisticated, needs quite a bit of use before you appreciate all its features. It works on an 80 by 30 screen, the bottom two lines being reserved for system status and command input. Entry is by CTRL or Escape sequences, although Torch has patched in a few commands on the function keys.

Torch maintains that most CP/M users will be used to using these sequences from other machines and that they are compatible with the company's larger micros. With a product such as a second processor, however, the user is more likely to have moved up from a 'straight' BBC micro than across from another CP/M machine, and will probably have been brought up on the function keys used by *Wordwise* or *View*.

Perfect Writer maintains a swap file and saves the text every few hundred characters you enter – useful if you lose mains power for any reason, as most of your file will remain intact. The program can hold up to seven documents in memory at once, and you can work on any two of these in variably sized screen windows. Text can be transferred from one document to the other and the working documents swapped in and out at will.

The system offers the useful facility of pre-formatted 'environments' in which commonly needed formats are set up with a single command. These include Lists, Verse and Quotations. Each environment can be modified from the default values set. The program can also maintain an index and footnotes to your text and will update them appropriately when you insert new text into a document.

Perfect Speller does what a spelling checker should, although with a distinct American accent. All *Writer*'s and *Speller*'s actions are carried out pretty speedily – certainly no slower than using *View* – and this is quite an achievement when you consider the Benchtest timings for the Zep 100 (AU, Janaury '85).

Perfect Filer, the database of the suite, is again an extensive program. A database created with it may fill a complete disc – that is, a CP/M disc, which is two disc surfaces on a double-sided

disc. Within that 400k of disc space you may have as many records as you can fit, and each of these may have up to 70 fields and a total of 1024 data characters. Two predefined files are provided on the *Perfect Filer* disc, one for handling a club membership file and the other for an address list. These files are useful for learning how to use the system and for simple filing tasks, but you will probably want to set up files specific to your requirements.

As with *Perfect Writer*, control is via CTRL sequences, although there are fewer to memorise. Setting up the record format is easy as the screen designer allows complete freedom to position fields and their titles anywhere within the record display. The designer is further simplified by the provision of a number of standard field 'templates'. In a similar way to the environments within *Perfect Writer*, *Perfect Filer* provides a standard format for a data field, a name field, an address field and many others. The program has been Anglicised, so there are no problems with zip codes or inverted dates.

Field types may be alphabetic, alphanumeric, numeric or status. A status field is used for single-character entries such as Yes/No answers. Each field must have a tag name, which is used within the record description, and *Perfect Filer* provides a reserved tag for automatically updating a date entry. The finished record can be edited, as long as no data has been entered on the file.

Sorting is carried out using a system of key fields, which are defined when the file is set up. Any number of fields may be defined as keys. A subset of the file may be set up by selectively searching through the database, and may be saved separately to disc. The information in the database may be printed out in a variety of ways, and *Perfect Filer* offers comprehensive facilities to define 'lists' containing these formats. Standard letters produced using *Perfect Writer* may be merged with data from *Perfect Filer*.

The manual takes the form of a series of tutorials and, like the other Perfect Software documentation, is bulky and fairly thorough. None of the manuals includes a precise specification of the capabilities of the software, but each comes with a quick-reference card showing the control key sequences.

Perfect Calc uses overlays and virtual memory techniques allow a spreadsheet of up to 64k to be processed at a time. A sheet containing up to 52 columns by 255 rows can theoretically be created, but you would have room for only the most trivial formulae on a model this size. The width of columns may be adjusted individually or throughout the model and you can flick through the sheet a row, column or screen 'page' at a time. All the usual controls are provided for manipulating the data in the model, and many of the control sequences are similar to those in *Perfect Writer*.

Formulae may use logical, arithmetic, statistical and trigonometrical functions, and calculation can be ordered by column or row. As with *Perfect Writer*, up to seven spreadsheets may be held in memory at a time and



the screen may be split to display sections of any two of them simultaneously. No graphics facility is included with *Perfect Calc*, but comprehensive formatting facilities to print the information detailed in a model are provided.

The remaining piece of software included with the Zep 100 is Z80 Basic. This is a later version of the interpreter supplied with the Acorn Z80 package and is written by R T Russell, to whom I touch my forelock. There aren't many people capable of writing a Basic interpreter, and fewer who can take an existing dialect with all the constraints that this imposes and convert it for a different processor.

This Basic is probably as close to the original 6502 version as is possible, and includes a built-in Z80 assembler. It is so well put together that a program written in 6502 Basic can be read into the machine, using one of the disc utilities supplied, and converted directly to run on the second processor. I succeeded in doing this with a couple of programs. Any sections of assembler are, of course, not converted.

The manual for Z80 Basic is thicker than any of the Perfect manuals, and this reflects the amount of information provided. It is good to have one piece of software at the end of an upgrade like this with which you can feel completely at home.

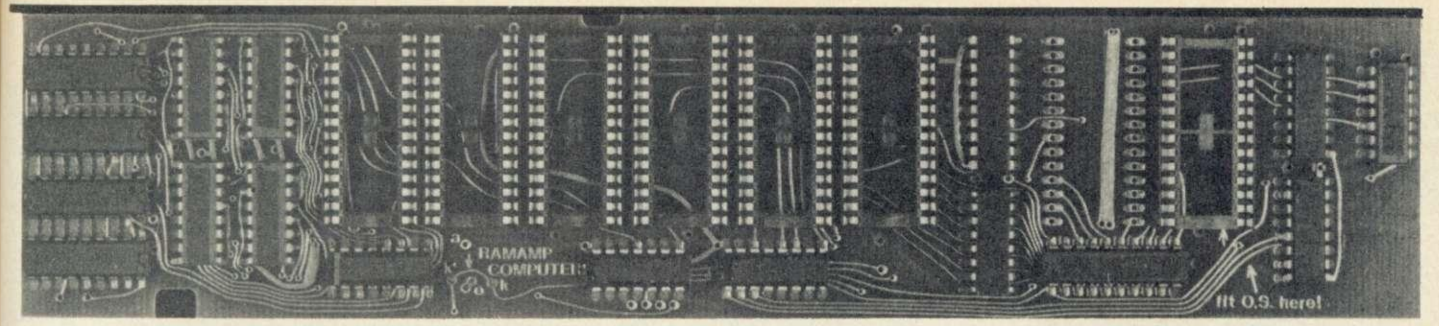
Since the Torch Z80 has been around for longer than the Acorn product, there's a large catalogue of CP/M software available on Torch format discs. This includes accounting packages, communications software (although networking routines are included in the MCP ROM), business graphics and a number of languages, as well as many alternative wordprocessors, databases and spreadsheets such as the league leaders *Wordstar* and *dBase II*. In all there are more than 120 titles. Should you buy the Torch Zep 100 in preference to the Acorn product? It really depends on what you want from your system. The Torch processor has been shown to be slower than the Acorn's Z80 system and the handling of the Tube is less sophisticated. However, when it comes to running applications software it doesn't seem to make a lot of difference. It may also be convenient for you to have the processor installed inside the micro's case.

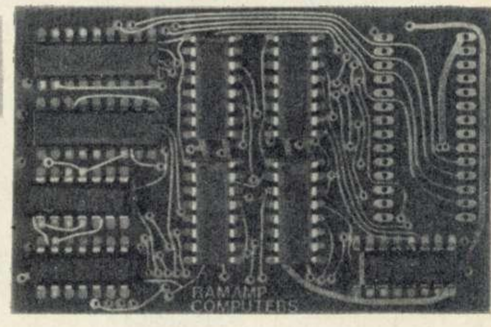
Where the Acorn product scores is in the amount of bundled software supplied. If you feel you will make much use of *Cobol*, *Nucleus* or *Accountant* it will almost certainly be cheaper for you to go for the Acorn (CIS Cobol alone costs £425 on the Torch). If you will make good use only of a wordprocessor, database or spreadsheet then the Perfect products are well ahead of the Chang Labs packages offered with the Acorn unit.

Both contenders for the Z80 second processor market have a lot going for them and it is always good to have a choice.

TORCH USER GROUP

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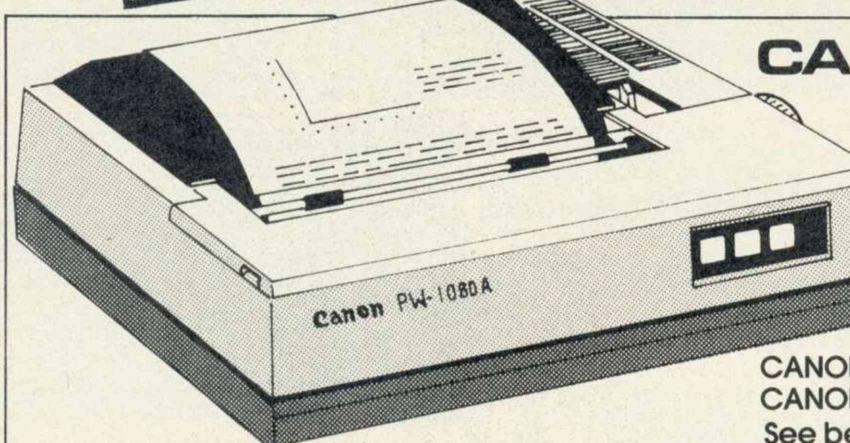

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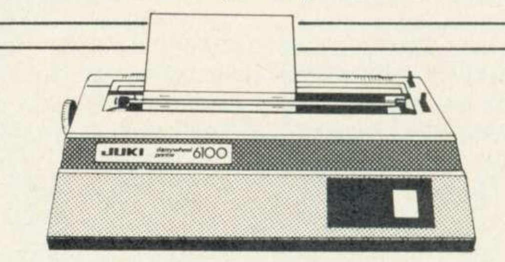
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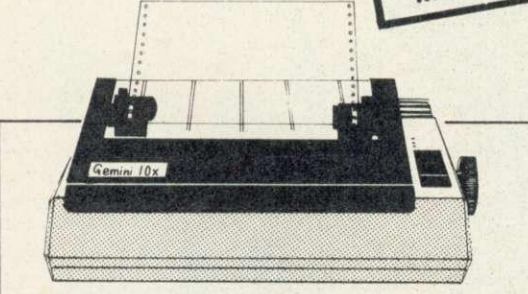
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Nightingale utilises a fully buffered RS 423/232 serial interface and is supplied complete with a lead suitable for connection to the BBC micro, other leads are available on request.

In order to use a versatile modem like Nightingale to its fullest potential, you will require equally sophisticated software. This is where Pace can offer you a total solution — Commstar, unquestionably the most comprehensive communications software available for the BBC.

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COMMSTAR - The Software



The complete Nightingale/Commstar package for the BBC micro including the modem, cabling and the Commstar Eprom and manual is just £139 plus V.A.T.

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Altra Probe is available in two versions. PROBE 1 and PROBE 2

ALTRA PROBE 2 IS TUBE COMPATIBLE

BASIC ED

Basic Ed, is on 8K ROM which contains 21 additional commands. They are: $ search, List matches, Number matches, Global replace, Selective replace, Bad programme relink, Copy lines from one part of a programme to another, Format a listing, Move, Super pack, Renumber, Table line references, Unpack, Variables X ref, List entire programme, Keyboard immediate mode, Printer on/off, Paged mode on/off, List match lines, Concatenate, Strips rems, spaces etc. Altra Basic Ed. is an essential helpful tool for the Basic / Assembler programmer. Altra Basic Ed. is available in two versions. Basic Ed. 1 and Basic Ed. 2.

ALTRA BASIC ED. 2 IS TUBE COMPATIBLE

FIRST AID 1.1

First Aid 1.1 is an 8K ROM which contains 19 additional commands. They are: Machine code dissembler, Hex and ASCII dump. Sideways rom to ram copier, Function key predefined facilities, Variable table listing, Memory space free calculator, Checksum calculator, Rom lister, String search, Define function keys with strings, Rem and space Stripper, Bad programme fixer, Clear all variables, Clear ram from &0400 to &8000, Machine code monitor, First Aid 1.1 as a language, Lists O.S. calls with their vectors, Lists the first 24 control codes. Altra First Aid 1.1 was designed to assist the Basic / Assembler programmer and the sideways rom user.

PICTURE ANIMATOR

Picture Animator is a mode 7 disc based high quality text and picture editor which lets you compose very sophisticated moving pictures. An ideal tool for the person who wishes to exploit the BBC micros teletex mode. The software is easy to use and your work can be saved to tape or disc.

MUSIC MAESTRO

Music Maestro is a superior and comprehensive disc based sound and music composer. All the sound facilities in the BBC are Utilised. Envelope composition is displayed graphically to assist you in determining the wave form required. Almost any musical instruments voice can be created and reproduced from the BBC. Music Maestro is simple to use and will save your symphony or tune to cassette or disc.







☐ I enclose my order for the above products.
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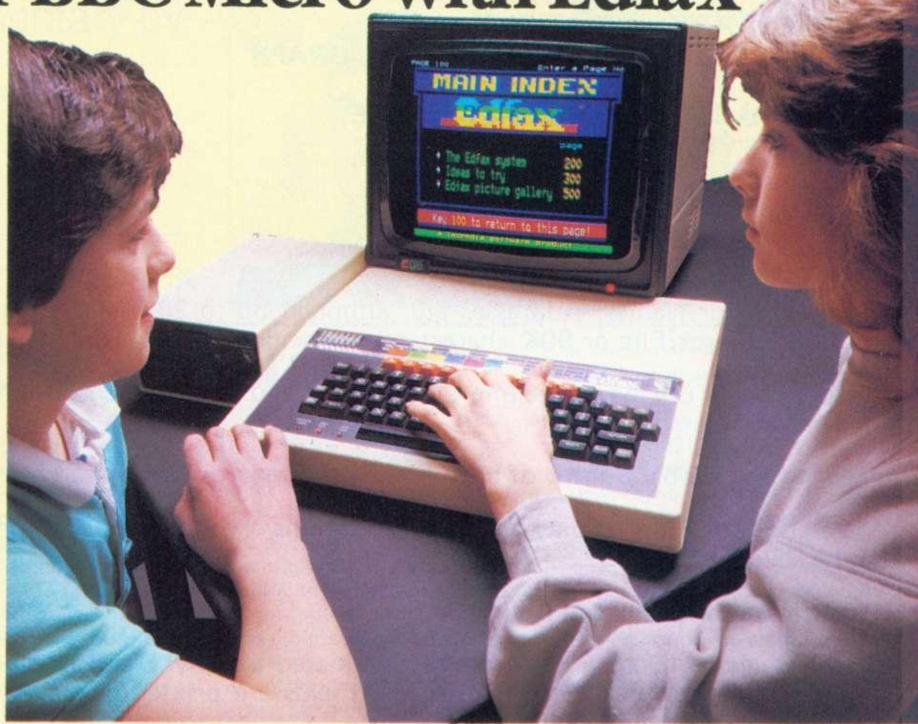
Telephone orders please ring: 0532 451508
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BASIC-ED 2	*@ £35·00*	

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M ix 'n' match words and pictures on your BBC Micro with Edfax



ONE OF THE TOP TEN EDUCATIONAL PROGRAMS OF 1984*

ONLY £19.95 (inc. P&P) (Plus £1.71 VAT)

Edfax is a software simulation of a teletext system (Ceefax or Oracle). Wherever access to information is needed, Edfax provides an exciting and stimulating aid.

SUCCEEDED BRILLIANTLY

Jacquetta Megarry, writing in the Times Educational Supplement, wrote:
"The Edfax team have succeeded brilliantly: they have not only provided the software, but also backed it up with first-rate documentation and educational support... a most accessible and likeable piece of software, thoroughly pilot-tested and thoughtfully presented."

WHAT THE EXPERTS SAY

Other reviewers have been equally enthusiastic:

"...there was no holding the children... Edfax is a most compelling activity." Ken Dyson, Inspector (Computer Education), Nottinghamshire.

"A happy coming together of science, art and English." John McGill, Head of English, Sturton by Stow School, in Teaching English.

"It presents a creative medium that can really be used to explore electronic communication." Educational Computing, June 1984

"Imagine how easy it is to update news or publicity material about your school activities." Primary Teaching Micros, July 1984

"The possible applications for Edfax are limited only by the imagination of the user..." Acorn User, July 1984

* In January 1985, Educational Computing, choosing from 1,500 educational programs, placed Edfax in its Top 10 programs of 1984.

EDFAX HAS SO MANY USES

Edfax is ideal for projects like electronic magazines, exhibition notice boards and home data bases. Computer dealers have used them to create software catalogues; schools have created displays of students work for open days; libraries have created information systems; art classes have explored computer graphics; children have illustrated stories and history projects.

The program comes with an 80-page sample database, giving examples of childrens work. You will see that Edfax is entirely content free and can be used right across the curriculum, or at home for recreational purposes

Edfax pages can consist of words, numbers, diagrams, tables, pictures – and a mixture of these.

SUPER FEATURES

- The powerful EDIT program allows you to implement all the features of a teletext system, including coloured text and graphics, double height text, flash, conceal/reveal and speedy updates of news pages.
- The program comes in 40-track and 80-track versions, with room for 182 pages of information on the 80-track version. You can build up a collection of disks covering a whole variety of topics.

- Having created your information pages, the DISPLAY program enables any page, or sequence of pages, to be recalled, simply by entering a three-digit page number. Users simply follow the instructions you provide to find their way through the database.
- The cycle page facility enables you to create automatic displays, with variable time delays between the pages. All the pictures on this page were created by schoolchildren using Edfax.

FIRST RATE PACKAGE

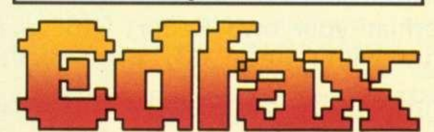
Parents and teachers will be delighted with the Edfax documentation. This consists of an illustrated 80-page book, in two colours, fitting with the disk into a stout PVC wallet.

A coloured key-strip and screen planning sheet are also included.

The educational thinking behind the disk represents the fruit of extensive school trials co-ordinated by the Microelectronics Education Program (MEP). Edfax was developed by the MEP and is regarded as one of its most significant contributions to educational software development.

FURTHER SAVINGS TO BE MADE

For example: **Classroom Pack.**
Buy five Edfax packs and pay only **£11.99 each.**
Total price – £59.95 + VAT for five. For further details of this and other savings, write to Tecmedia or telephone **(0509) 230248** today.
TRADE ENQUIRIES WELCOME



Tecmedia Ltd., 5 Granby St., Loughborough, Leics. LE11 3DU.

To: Edfax Offer, Tecmedia Ltd., 5 Granby St., Loughborough, Leics. LE11 3DU.

Please send me______Edfax pack(s) at £21.66 (inc. £1.71 VAT) each.
I enclose postal order/cheque for £______
made payable to Tecmedia or please debit my Access/Visa credit card

No.______

Signature______

Mr/Mrs/Miss______
(BLOCK CAPITALS PLEASE)
Address______

______Post Code______
Delivery subject to availability.
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A CHOICE OF 3 DATA BASES!

FROM BEL TECH

ALL FILES ARE COMPATIBLE
WITH BEL CHARTS, BEL PLOT and BEL GRAPH

ALL MENU DRIVEN AND EASY TO USE,
YET POWERFUL ! !

Mailshot

Use mainly for Names, Addresses etc. although up to 20 Fields are available with 480 characters/record and 600 Records/File or 90K characters on Random Access Disc Version. (14K Characters/File on Tape).

Default Values can be set (alpha or numeric) and amended and the Names and Types of each Field can be changed.

Selective and Global Editing of both Fields and Records with a search for any string/character on any Field.

There are both Find/Display and Browse options with the facility to print individual Records. Any Record can be Deleted/Replaced.

Disc Drives can be selected (0 to 3).

Sorts (Ascending/Descending) can be conducted on any Field as can Searches (<, >, < >,=,>=,<=) whether the Fields are printed/displayed or not.

Printer Control Codes can be sent.

Print up to 8 Fields Across or Down.

Label Printing (std., non-std, 1, 2, 3 across).

Bel Base

All of the facilities above PLUS:

Calculation Options. – Calculate the value of a Field from others – enter Functions etc. Specify decimal places.

Format your own Report with as many Fields as can be fitted into print width (max. 137 characters). Numeric Fields can be summed.

Print Formats can be saved for future use with new data.

Bel Base 2 (Disc Only)

The NEW Super Database Manager with EXTENSIVE FACILITIES

All of the facilities above PLUS:

Configuration Option allows easy selection of Disc Drives, File Names, Sort Fields etc.

Record size increased to 1200 characters and up to 2400 Records/File! Extension Files can take File beyond capacity of one side of Disc!

Minimum keystrokes are needed and extensive use is made of Function Keys.

Re-Calculate Option as per spreadsheet.

Mail Merge, Creation of Sub-files, Date Fields added to all of BEL BASE facilities.

Sort/Search on up to 3 Fields (change them at any time).

AND, OR, NOT Operators added.



Order Form	TAPE	QTY	DISC	QTY	TOTAL
BEL BASE	16.00		18.00		
BEL BASE 2	N/A		27.00		
BEL CHARTS	16.00		17.00		
BEL CHEM Chemistry 1	9.50		11.50		
Chemistry 2	9.50		11.50		
BEL GEN Genealogy	15.00		23.00		
BEL GRAPH	25.00		27.00		
BEL PLOT	16.00		17.00		
BEL SUBS	14.00		15.00		
MAILSHOT	9.50		11.50		

TOTAL inc. P. & P. £

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COMPUTER TYPE MODEL

DISC (if applic.)

CREDIT CARD No PAYMENT BY CHEQUE, P.O., VISA, ACCESS

Please Complete & Return to:-
BEL TECH Limited, College House, St. Leonards Close, Bridgnorth, Shropshire WV16 4EW
Telephone: 07462 5420 (24 Hrs.)

Muse hits the right notes

THREE exceptionally useful booklets at incredibly low prices have been made available by MUSE (Micro Users in Secondary Education). All were written by Richard D'Silva, a teacher at Bryanston School, Blandford, Dorset, as classroom notes, and as they are quite cheap (£1 per single copy and £7.50 for 10) they could serve as reference works for children to keep.

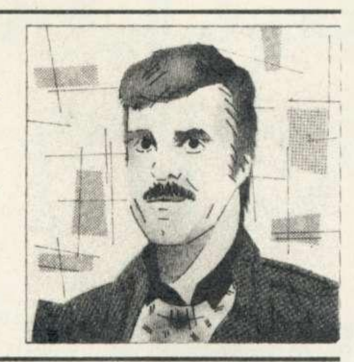
They deal with *Basic on the BBC Micro*, *Further Basic on the BBC Micro* and *Assembler on the BBC Micro – a beginner's guide*. The first *Basic* book covers such diverse topics as keyboard familiarity, variables, loops, graphics, sound, character definition, string functions and data. *Further Basic* continues with VDU commands, *FX, ASCII, procedures and functions, filing, indirection operators and sorting.

The *Assembler* introduction includes addresses, registers, two's complement and logical operators, in preparation for conditional branching, OSBYTE calls, immediate and direct addressing, OSWORD calls, two-pass assembly, indexed addressing and post-indexed indirect addressing – all in 30 pages!

In each book the material is divided up into tasks and activities, and the progression of ideas is simple and straightforward. As a cheap alternative to some of the ponderous tomes available at high prices at the moment these seem unbeatable value.

Contact MUSE Publications at PO Box 43, Hull HU1 2HD.

Commentary by Nick Evans, who welcomes reader feedback



Microtext – 'crippled at birth' by licences

ACORNSOFT's *Microtext* is an authoring package designed to allow anybody with common sense and the ability to follow instructions to create their own teaching programs without using Basic. It comes on cassette and disc or in ROM, each with its own peculiarities and facilities.

Microtext is one of the languages being used in the Domesday Project to interface the BBC micro with a videodisc player and was reviewed in *AU* October 1984.

You may already know this – *Microtext* has featured in this column before – but you probably didn't know that *Microtext* programs can be run without the *Microtext* code resident in the machine . . . if you have the publishing system, that is. When used with *Microtext* files, this system allows them to be run as if in the normal *Microtext* mode, but without access to editing facilities.

This means, for example, that a school developing a program to be used in other schools could package the file, together with the publishing system, and distribute the ready-to-use program. There is, of course, a price to pay, and the scale of licensing fees is shown in the panel.

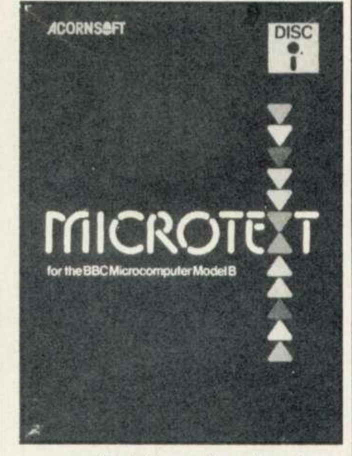
MICROTEXT LICENCES

Type A
In-house publishing. Provided the materials are to be used only in the educational establishment licensed, the rate depends on the number of computers available: 1-10, £30; 11-20, £45; 21-50, £65; 51-100, £100; 100-plus, £150.

Type B
Free distribution. This applies to materials distributed to other establishments at no charge. Either £30 plus 50p per copy, or £200 plus 10p per copy.

Type C
Commercial publishing. All materials developed for commercial sale. Either £6000 plus 50p per copy, or £250 plus £5 per copy.

Now it may seem as if power has gone to Acornsoft's head. The company's record in the educational market early on was nothing to shout about so why, when it has a really worthwhile package, does it appear to be crippling it at birth? The answer is simple – Acornsoft is a mere intermediary between the consumer and the National Physical Laboratory, which developed the program. NPL is calling the tune and, one suspects, even Acornsoft is not too happy.



As a publisher of vast amounts of software and associated materials you might not consider a £6000-plus licence fee exorbitant, covering as it does *everything* you publish from now on. However, the small school aiming to distribute materials free to other schools in its area is going to have trouble explaining away the seemingly pointless expenditure of £30 or even £200. And who foots the 'per copy' bill? If you unload that on the customer, the software is no longer free.

Inevitably, VAT has to be added to all the above charges.

More information from the Education Department Manager, Acornsoft, 104 Hills Road, Cambridge CB2 1LQ, tel: (0223) 316039.

STOP PRESS

ACORN has agreed to extend its Micros in Schools scheme to readers of *Acorn User*. This gives discounts on BBC micros and Electrons with peripherals.

Write for details to *Acorn User* Education Offer, Acorn Customer Services, 645 Newmarket Road, Cambridge CB5 8PD. Tel: (0223) 210111.

Quicksilva brings music to the class

THE music classroom could well benefit from the interesting sounds and rhythmic variations available on the *Music Processor* and *Drumkit* packages from Quicksilva.

Three sets of data files are available for the synthesiser program, including Bach, carols and Sousa marches, and impressive they are too.

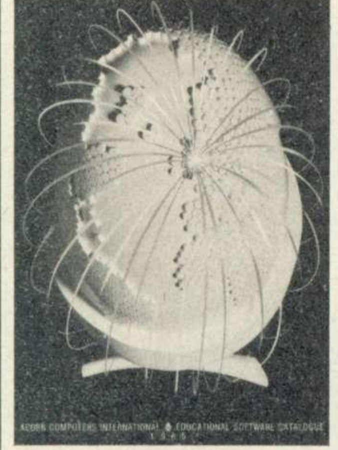
Actually creating the stuff is a little more complex. Multitracking is available in the tape-record simulator which even allows you to fast-forward through the music. Tunes may be built up with a wide range of envelopes using all four of the micro's sound channels. All the parameters may be altered and the speed of the execution of the data file may also be controlled.

The *Drumkit* program is excellent for demonstrating basic rhythm sequences and allows the use of snare, bass drum, sticks, electro and metronome, with the ability to stress any beat at will. Editing of the drum score is interactive while the program is running which means you hear the result as you change the parameters. Apart from being good fun it is also designed to be a serious instrument (although the sound system of the Beeb would need to be connected to a hi-fi).

Further details from Quicksilva, 13 Palmerston Road, Southampton SO1 1LL, tel: (0703) 20169.

'Approved' software list from Acorn

ACORN Computers has brought out a directory of 'approved' software called the *International Educational Software Catalogue*. International because Acorn intends to send the catalogues to the far corners of the world where software is, to say the least, rather hard to come by. But approved? By whom?



The £5 catalogue: 500 programs

Well, by Acorn Computers, which has selected the software on the grounds that the materials fulfil 'general educational and technical' requirements. The company makes a neat disclaimer in the catalogue, however: 'Users of educational software often have widely differing criteria when judging the suitability of a particular software package . . . whilst every attempt has been made to thoroughly test the software, Acorn Computers... cannot be held etc...' This seems a wise thing to say in any recommendation one makes. Acorn also ask for comments on any of the listed titles. All of which brings up again the question: 'What is good software?'

Objectivity is not enough when considering software for a list. The old maxim about one man's meat applies. Acorn have tried hard to make a compilation of what is worth having and most of their suggestions suited my taste, although some good material has been left out.

The catalogue has been well thought out and contains lengthy descriptions of many of the programs (500 are listed). Acorn and Acornsoft come first in the catalogue – simply because it's alphabetical (sorry, Aardvark). An excellent index enables the reader to see at a glance which age ranges are covered by the programs.

All this quality does not come cheaply, however, since this is not a sales catalogue. It costs £5 from Acorn Computers, Cherry Hinton, Cambridge.

Capital Media's low price programs out

CAPITAL Media, the publishing arm of MEP Capital Region, is publishing a wide range of software 'at the lowest possible price commensurate with a high standard of production and service'.

What makes this material interesting is that some of it has been developed under the guidance of Anita Straker (MEP primary co-ordinator) with documentation written by her. Two packages bear her name: *Mathematical Games and Activities, Vol 1* and *Mathematical Investigations in the Classroom*.

The first contains six programs on disc for use by individual children or small groups without supervision in the 5–16 age-range. As the package costs only £6 to those outside the region and £5 to those in it, there seems little point in worrying about which is the heaviest area of program distribution in terms of age-range.

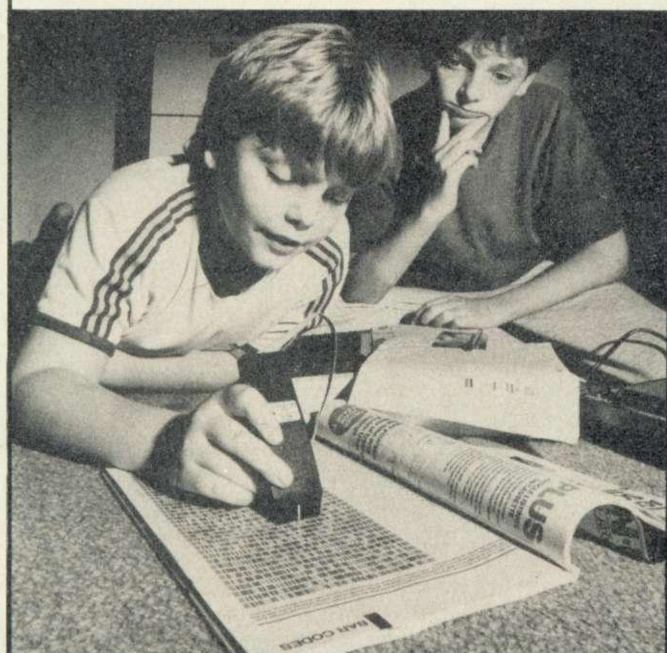
The second package contains 10 programs in which 'a practical activity is simulated and data is collected and tabulated so that children can discover general rules and develop "logical" strategies'. It costs £6 in the Capital Region, £8 elsewhere.

MICROSMILE

Also available from Capital is *Microsmile*, a package of 30 programs for the Beeb. Again, the age-range is wide and all the programs were developed by teachers working under the ILEA's SMILE maths project. *Microsmile* costs £15 outside Capital and £10 inside.

Capital Media is contactable c/o ILECC, John Ruskin Street, London SE5 0PQ.

Bar code projects grow



The MEP bar code reader is causing a stir in the education world where the variety and number of classroom applications is increasing all the time.

THE MEP bar code reader is the flavour of the month at the moment, not just in *Acorn User*, but in conversations between peripherals *aficionados* country-wide. I overheard one person say to a colleague: 'Yes, but what can you *do* with it?' The answer? 'You can do great lessons about bar codes'!

More seriously, several projects are under way at the moment, officially or unofficially, to develop materials for the bar code reader. These include items on stock control, and, in Sheffield, an investigation into library and resource management using the system. Other ideas have been mooted on classification and organisation of all manner of materials and goods. If you have 'dabbled' and come up with a good application for the classroom that you would like to share with us drop a line to Education News.

Logo papers to help new users

AN interesting collection of unexpurgated papers on the subject of Logo has been made by Fred Daly of Homerton College, Cambridge. Called *The Homerton Logo Papers*, the collection deals with the experiences of members on a course run at the college for Logo users during the first part of 1984.

It provides an interesting insight not only for those using Logo already but for newcomers, as it deals with several versions of Logo and covers various applications, including the use of this language, Turtle, Dart, Bigtrak and primary Maths. Real grassroots stuff, this – and well worth the marked price of £3.

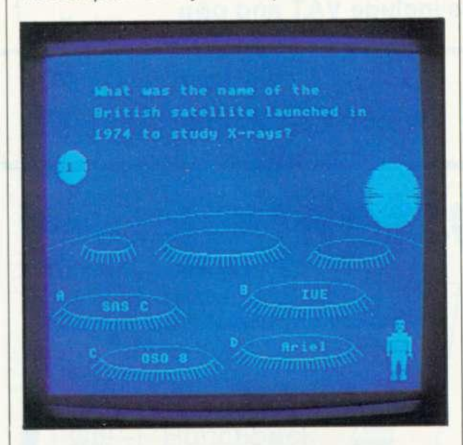

REWRITE THE HIGH SCORE TABLES
So, you've got a BBC. You've also got enemies. With the Gunshot, you'll have all the opposition cowering in corners. 8-directional action and an all-in-one moulded stem allows accurate annihilation and strength to survive those all-night sessions.
Dual fire buttons for fading fingers (and a rapid fire version when they're really coming thick and fast).
And, if you break it (and we know you'll try) our 12-month guarantee will prove invaluable. Only £8.95.
For the Gunshot, Vulcan's colour-coordinated, totally hardware BBC interface comes with a free tape which converts all keyboard software for joystick use. Exceptional value at £12.95, 12-month guarantee.
And, if you're a bit short of the readies, the Harrier is a tailor-made joystick which plugs directly into the BBC analogue port. Colour-coordinated and with a 12-month guarantee, only £10.95.
See the range of Vulcan joysticks and interfaces at your local stockist ... we'll see you on the high score tables.
VULCAN
ELECTRONICS LTD
Joystick Genius
200 Brent Street, Hendon,
London NW4 1BH. 01-203 6366

Whiz quiz

'Answer Back – Senior Quiz', Kosmos, 1 Pilgrims Close, Harlington, Dunstable, Beds LU5 6LX, tel: (05255) 3942, £9.95 (cassette), £10.95 (disc)

THERE have been quizzes a plenty in the past, but this one contains a considerable number of questions – 750 – with a selection of 3000 answer options for use in a variety of ways: multiple choice; completing the answer; yes or no.

The quiz is presented in a space-age context with a robot zapping the question into the sky of a planet (or is it the moon?). The answers are then printed below ready for the user's selection. Correct answers are rewarded with an alien skimming across the screen. You can shoot him down by pressing the space bar at the appropriate point and he lands in the middle of a crater, accompanied by an explosion and the

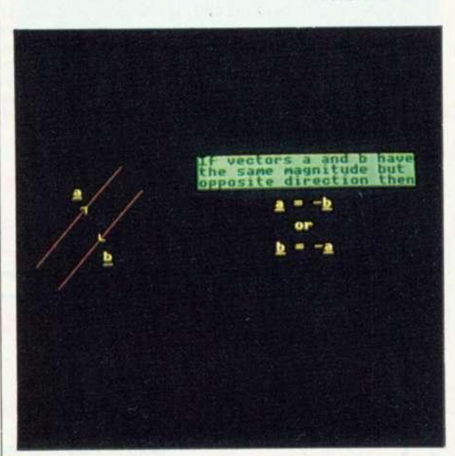


screen flashing – quite what this has to do with the quiz is never made clear! The user can opt to be timed and at the end of the run of questions – you select how many – the score and time are shown. You can then re-run the questions you passed on or answered incorrectly.

Perhaps the biggest bonus is that you can create your own quizzes and save them as data files for later use. This facility is useful for parents who want to encourage reluctant children to learn drab information but it does require a good deal of work to set it up. The main disadvantage of the program is the time it takes to get started if loading from tape – 10 minutes, with three loads required for the main program and a further file to be sought out and loaded for the data. The Break key can, of course, destroy all your hard work.

Nonetheless, it's a good package with a wide range of sensible questions. I must stress sensible, since so many software companies seem to fill data files with the weirdest material nowadays. Good fun, fine graphics and an interesting range of topics.

Nick Evans



Precision revision

'Vectors', Salamander Software, 17 Norfolk Road, Brighton BN1 3AA, tel: (0273) 771942, £14.95 (cassette)

SERIOUS software for the A-level student is pretty thin on the ground as most companies focus their attention on the primary market. So it's a pleasant change to find a detailed and comprehensive revision and tutorial work on a subject which causes many headaches in A-level and additional maths classrooms.

Vectors is a set of 14 programs which may be roughly divided into tutorial and testing. Each subject block is dealt with using graphic illustrations, animation where necessary and clear unambiguous text. It covers a wide range of topics under the vectors' umbrella including general principles, dot (scalar) product, ratios, three-dimensional vectors, the right-hand rule, the Cartesian equation and vector/plane intersection.

For ease of use each program leads into the next and you can choose in the end-menu either to re-run that section or chain the next one. The whole suite is easily transferable to disc although no menu is included. The handbook sets out clearly the objectives of each section and, within the programs themselves, it's not possible to progress until understanding of that section has been reached.

Well-written, well-presented and clearly produced by someone in education (a senior lecturer in maths), it's good value for money and an excellent revision aid for the student.

Nick Evans

Start making sense

'Word Skill', Chalksoft, PO Box 49, Spalding, Lincs PE11 1NZ, tel: (0775) 69518, £12.25 (disc only)

WHAT excellent fun *Word Skill* is! An old and simple idea has been transformed into an addictive and amusing word game by Chalksoft, a company with a reputation for good educational software.

In some ways this program is a less serious version of *Developing Tray* (reviewed May 83), and in fact, would make a good introduction to it. Short phrases and sentences are presented on the screen with all letters replaced by dashes – except for capitals which are shown by stars. You must fill in all the spaces to reveal the sentence before your time limit is up. The quicker you do it the more points you score. There are facilities for entering your own text and playing with a friend.

A most peculiar element is included – the computer will, if instructed, randomly combine words into syntactically correct sentences which usually make no sense. It's great fun as well as good practice in spelling unexpected words.

The list of phrases (sensible ones) includes sayings, proverbs, quotations, misquotations and even foreign languages! The user can alter the speed level and the volume – the machine plays a selection of tunes when you are successful.

Teachers may be interested that the same set of phrases can be repeated to different members of a class with a



running set of the 30 most recent scores available for inspection. Pressing Break will not lose the program or the scores but will return the user to the main option menu.

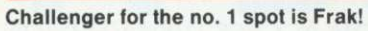
All in all, an excellent piece of software with much potential for home and classroom applications.

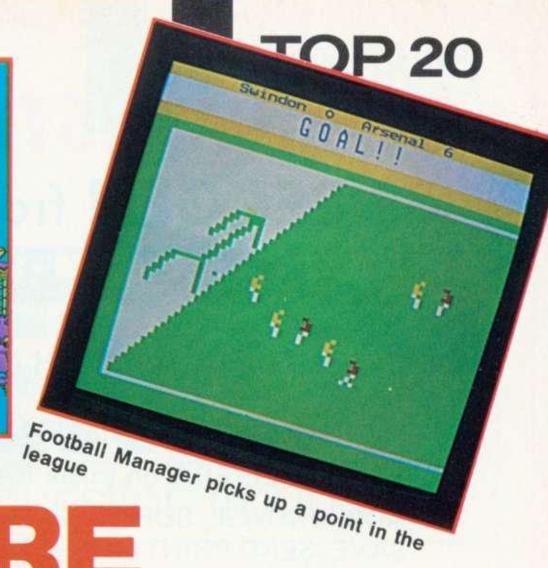
Nick Evans



Chukkie Egg continues its long chart run




Challenger for the no. 1 spot is Frak!



Football Manager picks up a point in the league



SOFTWARE CHART

	TITLE	PUBLISHER	PRICE	MICRO	REVIEWED
1 (1)	Elite	Acornsoft	£14.95 (£17.95)	B/E	October '84
2 (6)	Frak!	Aardvark	£7.50	B	September '84
3 (—)	Blockbusters	Macsen	£7.95	B/E	
4 (2)	Sabre Wulf	Ultimate	£9.95	B	
5 (4)	3D Grand Prix	Software Invasion	£7.95	B	February '85
6 (7)	Scrabble	Leisure Genius	£12.95	B	
7 (9)	Eddie Kidd's Jump Challenge	Martech	£7.95	B/E	March '85
8 (14)	Pole Position	Atarisoft	£9.99	B	March '85
9 (10)	Football Manager	Addictive	£7.95	B	March '85
10 (3)	Manic Miner	Soft Projects	£8.95	B	
11 (—)	Chess	Various	£6–£10	B/E	
12 (8)	Jet Pac	Ultimate	£7.95	B	
13 (—)	Hunchback	Ocean	£7.95	B	
14 (13)	Return to Eden	Level 9	£9.95 (£11.95)	B	
15 (re)	Acid Drops	Firebird	£2.50	B	
16 (—)	Music System	Island Logic	£24.95	B	
17 (15)	Chukkie Egg	A&F	£7.95	B/E	September '84
18 (17)	Fortress	Pace	£8.95	B	September '84
19 (18)	Hobbit	Melbourne House	£14.95	B	
20 (16)	Snooker	Visions	£8.95	B	

B = BBC. E = Electron. re = re-entry. Prices in brackets are for disc version.

BUBBLING UNDER

Jump Jet	**Dr Soft**
Micro Olympics	**Database**
Chartbuster	**Alligata**
Contract Bridge	**Alligata**
Mr Ee	**Micro Power**

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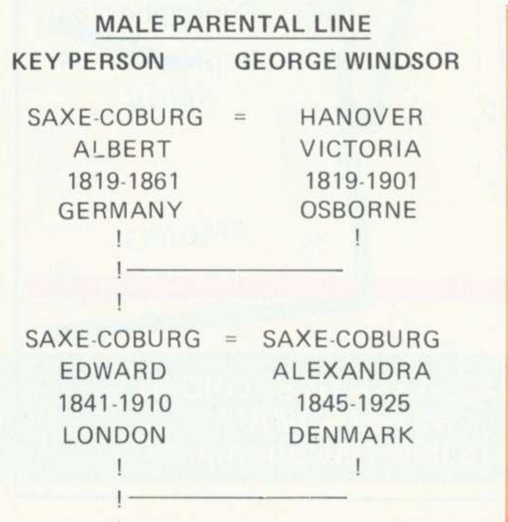


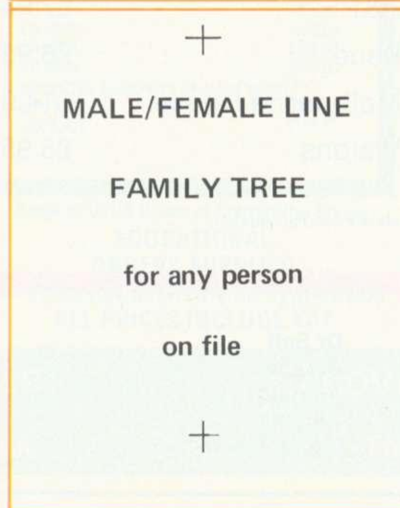
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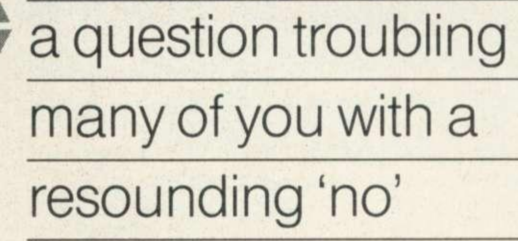
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DIAL-A-DEMON



Is a modem priced under £50 too good to be true? Bruce Smith answers a question troubling many of you with a resounding 'no'

Demon Modem, Rushworth Dales, 20 Orange Street, London WC2, £49.95 (+ VAT)

SHORTLY after the January issue of *Acorn User* hit the streets, my working life as technical editor took a turn for the worse – my phone began to glow red-hot as numerous readers called to enquire about the £50 Unicom Modem which was advertised in it. One irate Telecom engineer even 'phoned to say that the whole thing must be a con as no one could produce a modem that cheaply. So, does it work and if so how well?

The design has changed since that original ad. The box is a no-thrills beige plastic affair, supplied with copious lengths of lead. Dismantling the modem is not advised: you'll never get it back together again as the whole caboodle is held together from the inside with clips.

At the front of the modem are five small LEDs which indicate the modem status – eg, the current baud rate and the resence of a carrier signal.



Demon Modem: exceptional value for money

Three push switches are used to select mode, baud scan and standard. The mode switch selects the 'auto answer' feature – in other words, if you set up the software, the modem will answer any incoming calls to your bulletin board. The auto scan switch can be used in conjunction with suitable software to allow the baud rate to be detected and set automatically. Finally the standard switch allows you to select a different telephone system configuration, enabling you to contact databases in the United States.

Using the modem is simplicity itself. You obviously need some sort of firmware, and both Termi and Communicator are compatible. For best results, and to make full use of the hardware features such as the auto baud scan, the Demon Zromm is also available. This ROM supplies just about all the facilities you are ever liable to need, and again, it is easy to use. To call Prestel from within London for example just ensure that you are all plugged in and type *PRETZEL – that's all! The firmware will now dial the number for you, select the appropriate baud rate and display the Prestel title page onto the screen. If function key 11 has been pre-programmed with your ID number and password you will be logged on automatically, and can use Prestel.

Users outside London need to dial their local Prestel computer first and then enter *PRESTEL. Dialling is performed automatically with *DIAL.

The Prestel commands also set up various keys to allow you to move through the viewdata system with ease and speed. A typical example is the Copy key which will send *00 to the Prestel computer, informing it to redraw the current frame. Printer and downloading routines are also available at a stroke; f2 dumps the current screen to disc, while f7 dumps the screen to a printer.

With the modem switched to auto answer the command *ANSWER ON will invoke the auto answering firmware. In fact what it does is generate an error when a ringing phone is detected. A suitable ON ERROR sequence can therefore be included in your program to handle the incoming data.

The baud rate is set with *BAUD and transmission is full duplex – ie, it can occur in both directions at once.

Simple terminal firmware is possible with *CHAT. However this is limited, and *TERMINAL can be used when logging onto packed switch stream (PSS) databases such as BT Gold. In general PSS services such as Gold, MUD and The Source, can be accessed with a single *PSS command which dials the Slough Computer.

*DLOAD and *ULOAD allow data files to be sent or received, and three protocols are offered; *SEND and *GET act in a similar manner.

Other commands include *ON and *OFF to put the modem on or off line; *NOVEC disables the Zromm's interrupts: *HOPPIT totally disables the ROM; *PASSWORD allows the creation of a password should you wish to set up your own bulletin board: *STATUS is a sort of modem report command telling you what baud rate you have chosen, whether auto answer is on or off, etc.

And so to my verdict. In the short time I have been playing around with the Demon it has proved reliable and I see no reason why it should not continue to do so. The modem looks a cheap product, but combined with the Demon Zromm, it performs as well as – if not better than – any I have used. The auto dial and auto answer features are not available on many of its more expensive competitors and even the novice user would find it quite easy to implement his or her own bulletin board.

The inclusive price of the Demon Modem is £60, plus £24 for the firmware, bringing the total to £84 all-in – exceptional value for money.

Get to know yourself

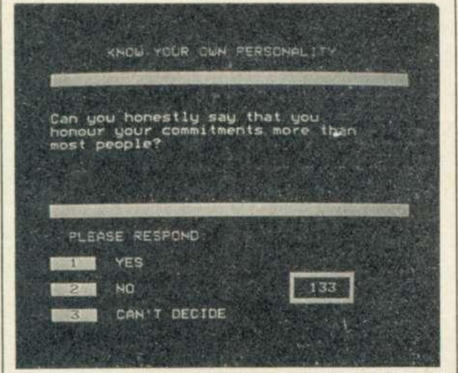
'Know Your Own Personality', Mirrorsoft/ Ivan Berg Software, BBC B and Electron, £9.95 (disc £12.95, available only from Mirrorsoft direct)

THIS program is a computerised version of the book of the same name by Hans Eysenck and Glenn Wilson, published 10 years ago, although only three of the book's six tests are included on this software.

These tests are said to measure, respectively, your extroversion/introversion factor, your emotional stability and your tough/tendermindedness quotient.

Each test consists of 70 questions, to which you respond <1>, <2>, or <3> according to yes/no/can't decide. When you've answered the questions the results are shown in bar chart form, together with background comments about your various characteristics, and can be stored on tape or sent to a printer.

By an odd coincidence I had a copy of the book with the tests completed. So I was able to compare my answers now



with those of 10 years ago and they were almost identical.

The computer is certainly a much faster and easier vehicle for doing the housekeeping than the book, where a cumbersome system of ticking off the answers, adding your scores and making your own marks on the graph is called for (if, unlike me, it doesn't take you 35 attempts before the program loads, that is!), and the bar graphs are well presented.

The questions have been reproduced absolutely faithfully from the book and no attempt made to clear up ambiguities in the original – how do you interpret 'Do you like entertaining people', for example? I noticed that 10 years ago I answered 'No' to the question 'Do you always wear a seat belt?' whereas this time round I answered 'Yes'. The reason is nothing to do with my attitude to seat belts changing, merely that the law has changed in the intervening period and I don't want to get prosecuted by the police! Nevertheless, there are enough questions to answer in each test without your response to individual cases affecting the overall picture too much.

Psychologists, for obvious reasons, tend to be both bland, flattering and extremely general in their descriptions of people they've never met. So if the program tells you you're 'assertive, impulsive, creative, ambitious . . .' don't kid yourself that others don't think you're a homicidal maniac from whom society should be protected!

Still, it's a good program if you like this sort of thing and, since inputting the answers to the questions is so easy, a good introduction to the fun of home computers.

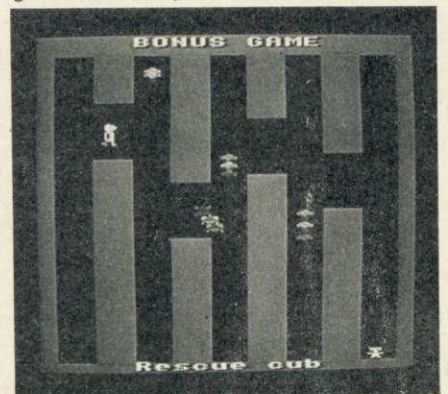
Simon Dally

Bear necessities

'The Sting', Gemini, BBC B, £9.95

BRUNO the bear and Teddy the cub against the world – oh, all right, I'm exaggerating. Bruno is greedy; he likes fruit and is not above swiping it from the orchard. The enemy on this occasion is a wasp which blunders around the orchard. Should ever the twain meet Bruno turns his badge in and his toes up. He can hide behind logs and sometimes temporarily stun the wasp with an aerosol.

The fruit is scattered about the corners of the orchard and has to be eaten by Bruno in a set sequence. Clearing one lot of fruit gives you the chance to score bonus points by moving through a maze and reaching good ol' Teddy, but that wasp is still



involved, bumbling around and crashing into things. You also have to avoid wandering poison mushrooms on the long march to Teddy, or you don't get a bonus.

You have three lives. The action gets more complicated with different shaped orchards and more little caches of fruit as you go on.

Controls are simple – the up/down/ left/right variety. The graphics are OK without being spectacular and the sound is confined to bursts of the Scott Joplin classic.

Not a bad game, which would probably appeal to the younger members of the family.

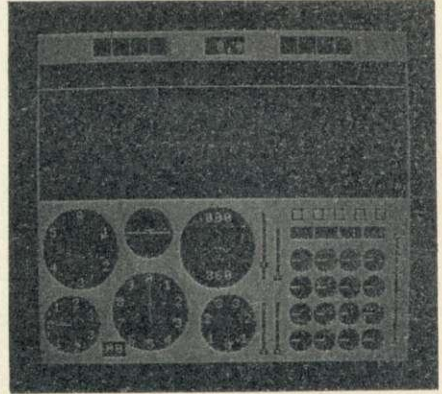
Harry Sinclair

Bumpy flight

'747 Flight Simulator', DACC, BBC B and Electron, £9.95 161

WITH great patience and adjusting of volume, I eventually managed to load the program, one of the vast range of flight simulators currently available, which I found to my horror was written entirely in Basic! The screen presentation is very poor, although there is the option to use a joystick.

You have to decide the quantity of fuel and passengers for your flight and whether to land or take off. The cockpit is then drawn slowly, containing the usual dials – altimeter, compass, etc, including various failure reports such as engine fires and brake failures,



which all add to the excitement. Sadly it's only drawn in two colours, but you can change these to your taste. The plane is then in your hands to crash, or, possibly, to fly!

In all there are about 30 keys to be pressed, controlling brakes, landing gear, flaps, direction, etc.

The pilot's view is very disappointing – the horizon never moves and the only scenery is the runway.

All bad things aside, the program is simple yet effective and the programmer really seems to know what he's talking about.

The accompanying instruction booklet has in-depth information about the basic concepts of flying, as well as the instructions, which is quite unusual. It explains how each instrument helps to manoeuvre the aircraft and when it should be used. In fact, it makes up for the bad use of colour, sound and graphics.

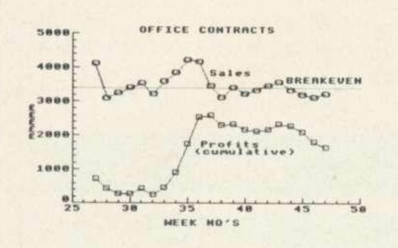
Jonathan Gill

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BIOGRAM is a new concept in computer software

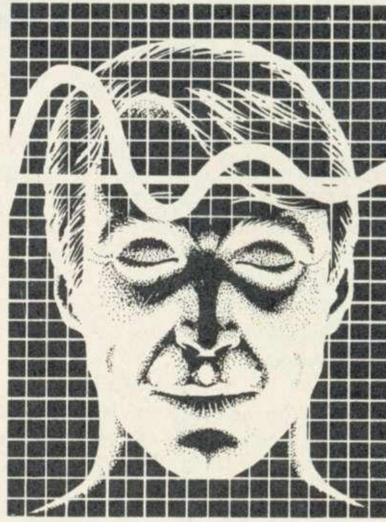
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Creative colouring

'Electronic Colouring Book', Addison-Wesley Software, BBC and Electron, £9.95

I'VE forgotten what it's like to mess about with paint pots and crayons. From what I remember about my own children's creative bursts, the excitement seemed to centre on how many different colours they could get on the ceiling before I started laying about



them with my trusty club. This program takes the mess (and possibly most of the fun) out of the process.

Eighteen outline drawings are provided for the little dears to colour. First the main program is loaded and then you can load in one of the drawings if you wish. Four of the drawings have colourings which can also be loaded from the tape. Down the right-hand side of the screen is the colour palette which contains quite a few 'new' colours,



obtained by pixel mixing – there are 35 colours in all. Moving the cross-hair sights onto a colour using the keyboard or joystick enables you then to move over a section of the picture, press 'P' and see the whole of that section filled in. You don't have to use the drawings provided – you can make your own using the 'draw' facility, and drawings and colourings can be saved.

There are options to redefine colours and to let the machine cycle at random through a series of colour combinations. The outline drawings provided are excellent and it's difficult to believe that low resolution mode 2 graphics are used.

All quite pretty and certainly easier on the carpets and wallpaper, but is it as much fun?

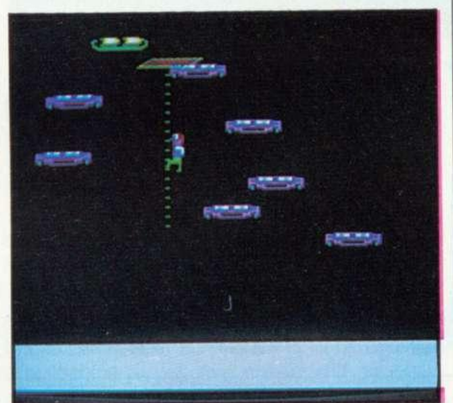
Harry Sinclair

Magic carpet ride

'Sinbad', Virgin Games, BBC, £7.95

VIRGIN games have recently been making noises to the effect that they are trying to improve their software lists and their somewhat shaky reputation. *Sinbad* is one of the first offerings in this new wave.

The company has removed its header page from this game – rather a shame since it was one of their best features in the past, and it loads commendably quickly to display the standard control keys, which are not redefinable. The game features a very lanky Sinbad climbing up and down a rope ladder to his magic carpet and trying to



convert things that look like cold-cure tablets into things that look like angry tape cassettes. If you touch a converted creature you are knocked off your perch onto the ground and have to jump on again when the carpet comes within reach.

Changing all the weirdos into other odd creatures moves you to the second game, which has Sinbad on his carpet flying over the earth, while avoiding asteroids which zing past in a fairly convincing attempt at 3D. If you hit any rocks, your energy is sapped. This stage lasts as long as it took you to complete the previous stage, which would be a clever idea if avoiding 3D asteroids was new or exciting.

After this interlude it's back to jumping on carpets and changing floating rocks to hysterical albatrosses. This time you also have to avoid a very wide spider who also saps your energy if touched. All this energy is being drained away without anyone telling you about it, until it has run out. The higher levels feature snakes as well.

The high score screen shows the percentage of the journey you completed. Virgin advertise *Sinbad* as 'fun for all the family'. My three-year-old certainly enjoyed it, but I wasn't inspired to try for 100 per cent.

Simon Williams



Pick off a penguin

'Pengi', Visions, BBC A/B (32k, OS 1.2) and Electron, £5.95

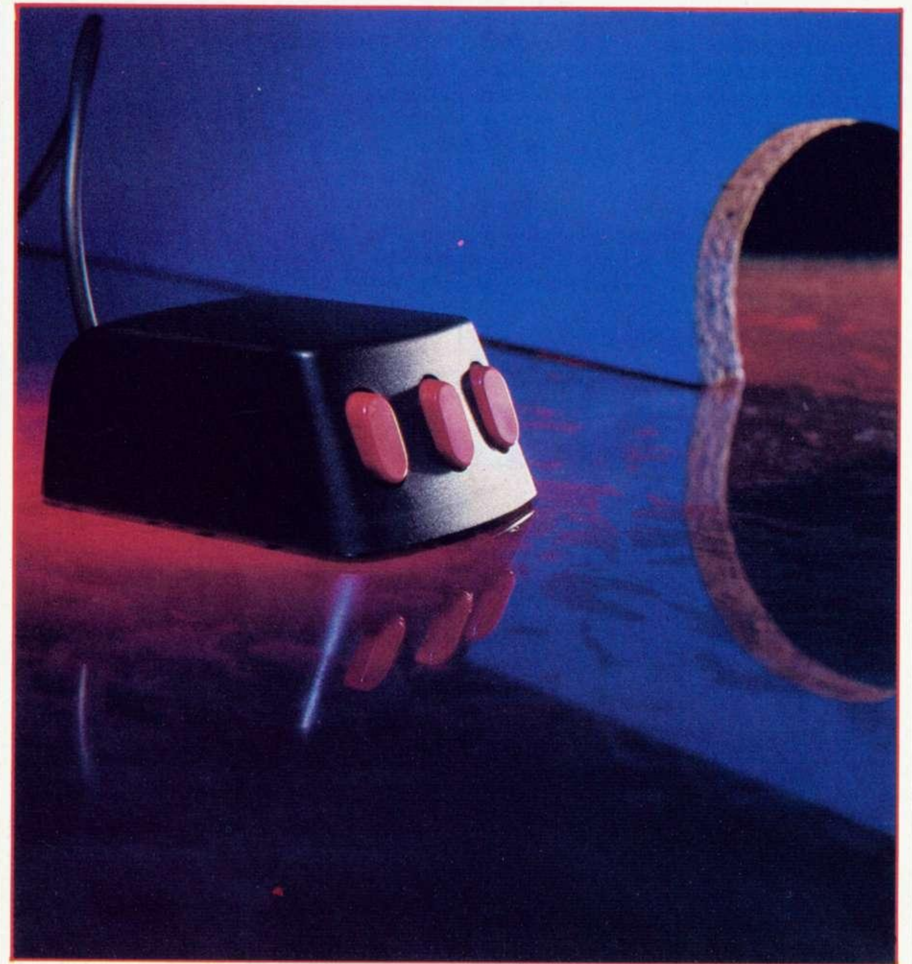
IN *Pengi* you are a cute little penguin who wanders around a freezer dodging snow bees and kicking ice-cubes at them. The idea is to kill all the nasty bees in this way, or alternatively entice them onto the surrounding fence, where you can electrocute them.

Another way of moving onto the next screen is to line up the three diamonds lying around – not as easy as it sounds. (Don't kick the diamonds into the corners of the screen because you won't be able to kick them out again.) As the game progresses, more and more bees appear, and as you work your way through the 30 screens, you wonder why they keep coming back for more.

The program is well documented and is 100 per cent machine code. It includes a high score table and a practice mode in which you can play to your heart's content without getting killed. Other features are – redefinable keys; sound on or off; pause and various bonuses.

The game is of a very high standard. Colour, sound and graphics are used to their full extent, although the game isn't as original or exciting as I would have liked. The 30 ice-cube mazes are almost identical but, I must admit, it's addictive.

Jonathan Gill



MIGHTY MICRO MOUSE

A mouse in the house (or office) is an asset not a pest, says Bruce Smith

AMX Mouse, Advanced Memory Systems, Woodside Technology Centre, Green Lane, Appleton, Warrington WA4 5NG, £89.95 inc VAT

THERE is probably more jargon in the computer world than in any other hobby, and in the last year or two another word has joined the ever-increasing vocabulary – the mouse. This is a free-moving hand-held object with one, two or three buttons. The base contains a bearing mechanism that allows the user to roll it across the desk top. When used in conjunction with suitable software, it makes the keyboard obsolete, as programs and tasks become completely menu-driven, and courses of action are chosen by moving a mouse-controlled cursor across the screen to a particular item (this might be a number, letter or small picture). The cursor movement is controlled by rolling the mouse across the desk-top in the appropriate direction. When it's in your chosen position you press a button on the mouse to make the selection (like hitting a key on the keyboard), and the program recognises it and acts accordingly. Until now only the larger business-orientated micros, such as the MacIntosh, provided such a device – a trend which may now be reversed by the introduction of the first 'low-cost' mouse for the BBC micro.

The AMX Mouse is a complete package at under £90 that includes the mouse itself, a connecting cable, a sideways ROM incorporating the 'driving' firmware and some excellent cassette-based software.

Installing the AMX Mouse is straightforward. The ROM plugs into a suitable sideways ROM socket, while the mouse connects via the user port. The AMX Mouse feels good, fitting snuggly into a cupped hand. Three red buttons project from the front of the black plastic case and are easily manipulated by the middle three fingers, whether you're left or right-handed. A metre of cable is supplied and allows remote operation of the mouse.

Selecting the user port as the interface to the Beeb is a good move as it frees the analogue port for joystick or other applications – though I suspect the choice was made for reasons of ease of interfacing.

On the technical side, the AMX Mouse uses only five bits of the port (bits 0, 2, 5, 6 and 7) plus the two control lines, CB1 and CB2. 6502 second processor compatibility is guaranteed.

With the mouse correctly installed, powering-up the Beeb displays the MOUSE OFF message along with the usual system details. The mouse is activated by typing *MOUSE ON. This command re-directs the operating system vectors EVENTV and KEYV into the AMX ROM, thereby rendering them unavailable for any other use – it's possible to reclaim them by typing *MOUSE OFF.

One of the first uses of the AMX Mouse is in editing programs. *MCURSOR ON allows the mouse firmware to grasp control of the screen cursor. The three mouse buttons can then be programmed using *BUTTONS to emulate any three keyboard keys. The best combination is Return, Copy and Delete for easy editing. This can give you sore fingers, however, as there is no auto repeat facility on the mouse-keys so, for instance, every character to be copied requires an individual button press. Alternatively, frequently used function keys may be selected. Use of *BUTTONS in conjunction with *FX228,1 allows use of the mouse in *View*.

The mouse is astonishingly sensitive to movement, but the inclusion of a *SENSITIVITY command allows this to be tempered to more humane levels!

Included in the firmware is a set of 64 icons – these are rather like a cross between user-defined characters and sprites. In fact, each icon is constructed

from four characters displayed on a 2 × 2 character grid. Each icon is allocated a number in the range 32 to 95, and may be displayed on the screen using *ICON n, x, y where n is the icon number and x and y the TAB co-ordinates. Figure 1 shows the icons always on tap; these may be added to using the Icon Design package.

Icons can also be used to replace the mouse 'cursor' or pointer, as it is more correctly known. The pointer must first be turned on with *POINTER ON, followed by *POINTER n, where n is the number of the icon to be used. A second parameter may also be specified to allow a background mask to be chosen. The three commands *SHOWPOINTER, *MOVEPOINTER and *HIDEPOINTER allow the pointer icon to be displayed, erased and moved around the screen by the mouse.

Windows may be incorporated into programs by use of the *WINDOW command. This allows multiple text windows to be drawn into the screen, rather as with a VDU28 sequence. A title string may be specified as the last *WINDOW parameter, in which case this will be printed at the top of the window. Any text issued will be directed to the last defined window. This command allows 'pull-down' menus to be created.

Other commands in the mouse vocabulary are *DEFINE, which allows user icons to be loaded into memory; *DESK, which clears the screen to a grey desk-top pattern; and *UPDATE. This command can be used in conjunction with the OSWORD call provided for assembler use to allow the status of the mouse to be read and acted upon.

Inevitably there are drawbacks with the system. It is not compatible with 20k RAM extension boards – the Aries B20, for example – which is a great shame. The system requires a 1.2 OS to be installed, which presumably puts it outside the realm of 1.0 owners. The OSWORD call implemented is call number 64, which is not one designated by Acorn for commercial expansion, and so could mean that the system might not be compatible with future Acorn products.

The manual supplied is too skimpy, and does not include the copious examples it should. It also contains several discrepancies. For example, the command *END is used frequently, but is not documented. The *POINTER command is also referred to as *POINT which, if used, will cause an error.

The manual makes no mention of the fact that the system can only be used to its full potential in modes 0 and 4 – which also means that it is limited to just two colours.

The system is very versatile, however, and this is best shown in the support packages supplied on tape. The Icon Designer mentioned earlier is a good example. The whole program is written in Basic and allows real time movement of icons around the screen. Using the arrow pointer, icons may be



Figure 1. These icons are always on tap

picked up, carried and deposited in the designing area where they are drawn larger than life. Using the pointer and mouse buttons, individual icon pixels may be set or cleared. The finished design may then be carried back down to one of the positions in the file and deposited. User defined icons, which are numbered 0 to 31, may be loaded and saved from or to an appropriate medium.

The AMX Art program is the main software package (produced by Elliot Software) and would merit merchandising on its own. Across the top of the screen are headings, and by moving the pointer to one of these and pressing a button, a pull-down menu will be displayed from which a further selection can be made.

The upper right-hand side of the screen contains the artist's instruments, selected by moving the pointer and pressing the appropriate button, and these include pencil, spray gun, roller, eraser, boxes, circles and text.

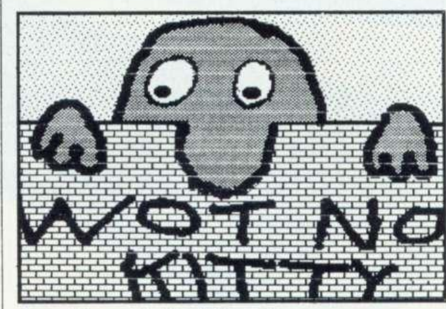
Below these are the spray-size boxes which determine the type of spray used by the spray gun.

The bottom section of the screen is given over to the pattern boxes which determine the pattern produced by a spray or fill routine, and include everything from the occasional dot to wickerwork. The AMX Art package is simple to use. The mouse is manipulated to select an instrument which now becomes the pointer, and, if required, the spray size and pattern requirements are chosen. The pointer is moved onto the canvas and the fun begins.

A manual is supplied outlining the package and, thankfully, is more informative than the mouse user guide, and provides some excellent examples.

The range of uses for the mouse and AMX Art are wide. After you've got the inevitable initial doodling out of your system, charts, diagrams and more serious art applications are possible.

The system's ease of use is typified by my four-year-old daughter's addiction to the system and I now have to remove her physically from the micro before I can use it! Using the FILE menu option, designs can be saved and loaded to tape or disc or dumped to a printer. Two printer dump routines are included – PRINT × 1 dumps the screen in about 4 × 2 in of paper, while PRINT × 8 uses a whole fanfold sheet of paper. The printer routines are Epson compatible, but there is a further option to enable user dump routines for other printers to be incorporated into the package. A disadvantage of the package is that it is only available for use in mode 4 and is limited to two colours. Also, it is not second processor compatible, as it addresses the



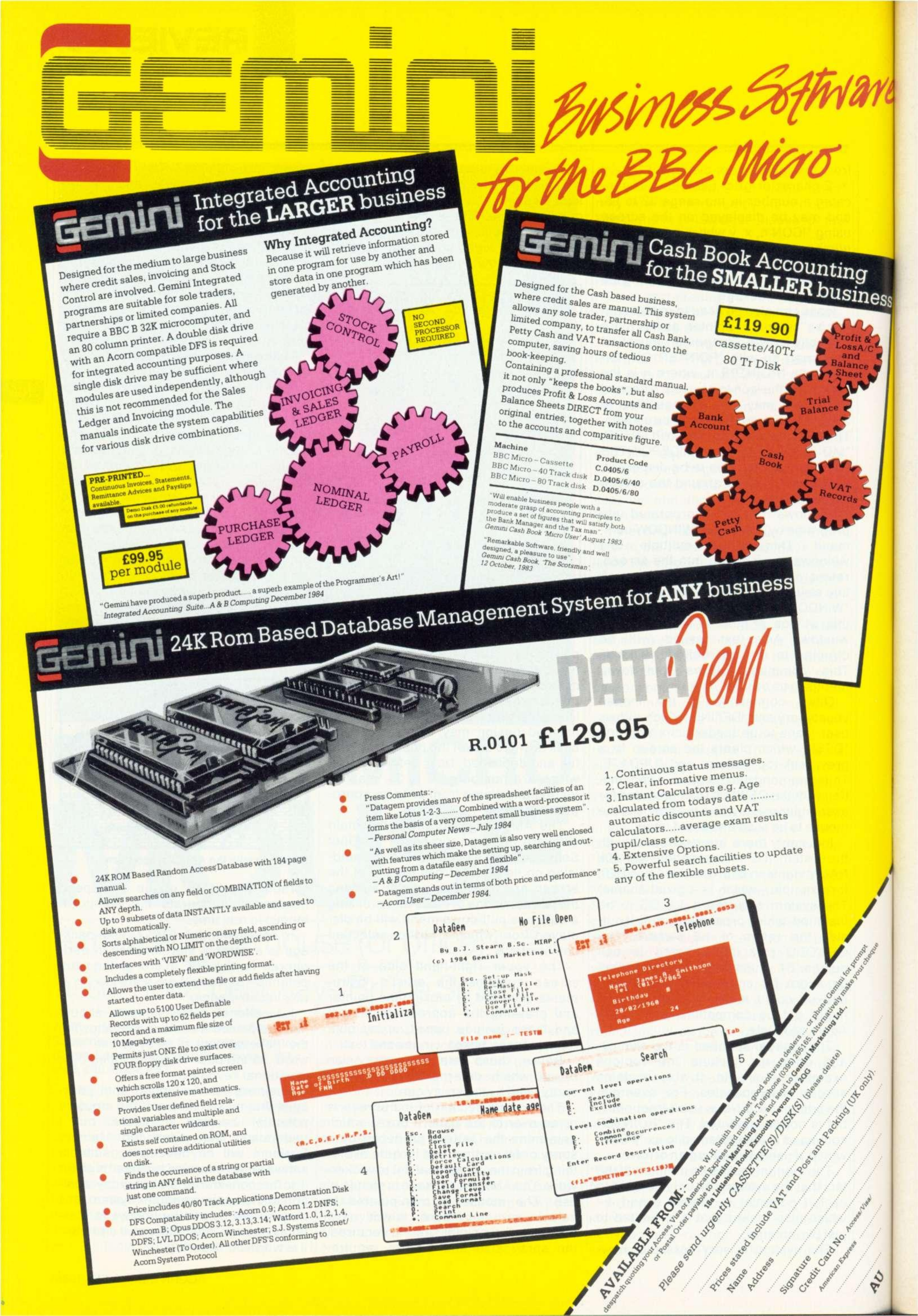
Doodling with the AMX Art program

screen directly to obtain the speed necessary to operate the pull-down menus in real time.

In conclusion the AMX Mouse package is a notable step forward in peripherals for the BBC micro, giving it the potential of operating software in a MacIntosh manner.

Educational establishments should find the device a positive aid, allowing the development of easy-to-use software, as the pupil is not inhibited by a traditional keyboard.

Business use is limited until packages that make full use of the mouse's potential become available, but I understand that Advanced Memory Systems will be developing suitable software. As the price is rather high for it to be considered an everyday addition to the home computer system, this may curtail its use by hobbyists. Certainly, though, after discs and a printer, it is worth considering.


Gemini
Business Software for the BBC Micro
Gemini Integrated Accounting for the LARGER business
Designed for the medium to large business where credit sales, invoicing and Stock Control are involved. Gemini Integrated programs are suitable for sole traders, partnerships or limited companies. All require a BBC B 32K microcomputer, and an 80 column printer. A double disk drive with an Acorn compatible DFS is required for integrated accounting purposes. A single disk drive may be sufficient where modules are used independently, although this is not recommended for the Sales Ledger and Invoicing module. The manuals indicate the system capabilities for various disk drive combinations.
Why Integrated Accounting?
Because it will retrieve information stored in one program for use by another and store data in one program which has been generated by another.
NO SECOND PROCESSOR REQUIRED
STOCK CONTROL
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PRE-PRINTED... Continuous Invoices, Statements, Remittance Advices and Payslips available.
Demo Disk £5.00 refundable on the purchase of any module
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1
Initializ
Name Date of birth Age
2
DataGem
No File Open
By B.J. Stearn B.Sc. MIAP.
(c) 1984 Gemini Marketing Lt
Esc. Set-up Mask
A. Basic
B. Re-Mask File
C. Close File
D. Create File
E. Convert File
F. Use File
*. Command Line
File name :- TEST
3
Telephone
Telephone Directory
Name James.A. Smithson
Tel (01)-67865
Birthday
20/02/1960
Age 24
4
DataGem
Name date age
Esc. Browse
A. Add
B. Sort
C. Close File
D. Delete
E. Retrieve
F. Force Calculations
G. Default Card
H. Report Card
I. Load Quantity
J. User Formulae
K. Field Transfer
L. Change Level
M. Save Format
N. Load Format
O. Search
P. Print
*. Command Line
5
DataGem
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Current level operations
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ALL • ABOARD • FOR EXPANSION

Chris Drage puts you on the right track when making your choice from the ROM/RAM boards available

SIDEWAYS or paged ROMs are a feature of the BBC micro – you can de-select the Basic ROM in your machine and select one of three ROMs or EPROMs plugged into the sockets under the keyboard.

In practice, the Beeb's operating system (OS 1.2) can cope with up to 16 paged ROMs, and a number of manufacturers have produced add-on boards to extend the number of physical sockets available. Many of the boards on offer allow you to locate RAM (read/write random access memory) as an aid to EPROM development. This 'sideways' RAM takes the place of one or more paged ROM sockets and cannot generally be used for Basic programs. The list of boards in this article summarises the facilities each offers.

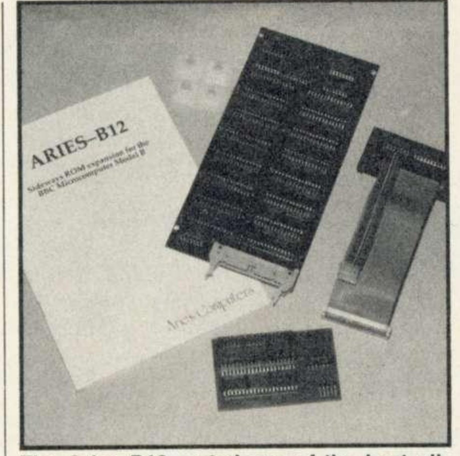
The major problem with expansion boards is that the Beeb is not designed to accommodate them, despite being able to cope with 16 paged ROMs. A 12-socket board takes up a great deal of space inside the machine, and when fitted with 12 or more devices it also becomes quite heavy, leading to difficulties if the computer is moved.

Any board covering the Beeb's RAM area may lead to overheating, resulting in the corruption of data or system crashes. Picking up the lines necessary for operation can cause some soldering headaches, although many boards are now of a plug-in-and-go design. Each manufacturer has adopted different solutions to these problems with varying degrees of success.

The major factors to consider when choosing a ROM/RAM board are ease of installation, reliability in operation, physical stability of the board, and your current and future needs regarding sideways firmware

Ramrom 15

At the top end of the market is the all-feature *Ramrom 15* from GCC (Cambridge). This beautifully designed and constructed peripheral which is



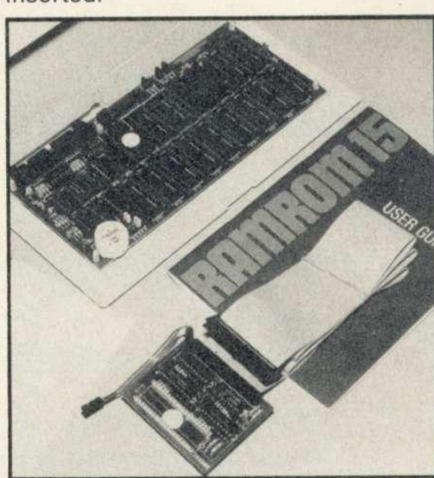
The Aries B12 – rated one of the best all-rounders

mounted outside the machine is one of the best ROM expansion units available, but at a price! For £129, though, you get a durable, high quality product. The system comprises a ROM board mounted in a steel box, a driver board which lives inside the computer, a 36-page manual and a disc of software to utilise sideways RAM for firmware development.

The Ramrom 15 can accommodate up to 11 ROMs and one area of paged RAM. The four ROM sockets in the BBC are also used, so the total number of available sockets is 16. The system, however, can make use of an infinite number of ROMs when an optional ZIF (zero insertion force) socket is utilised in one of the sockets. EPROMs can then be quickly and easily swapped with little possibility of damage.

It is mounted outside the BBC micro and this certainly has advantages when it comes to installation and chip insertion/removal. The driver board sits in the 6502 socket, and the processor chip is mounted in the corresponding socket on the driver board. There is one flying lead to link S21, then you direct the ribbon cable to the back of the micro, fix the cable clamp and you're in business.

The Ramrom 15 board connects with the cable via an IDC connector similar to those under the BBC micro, which facilitates the removal and portability of the Ramrom 15. As both the driver board and the Ramrom 15 are fully buffered, no data loss occurs over the lengthy ribbon cable. The metal housing has a hinged lid which can be removed altogether if required. In use or in transit, the board is very secure on the mounting pillars within the case, and no flexing occurs when devices are inserted.



The Ramrom 15 – the most expensive board but built to high specifications

When used with sideways RAM the system reveals its advantages. Four slots may be configured as a block of 2, 4, 8 or 16k of static RAM, and these slots are recognised as socket 4. Setting a link enables priority of selection to be assigned to either RAMs or ROMs, thus the RAM location may be switched to the highest priority position. RAM may also be write protected by selecting another link.

Battery backup for the RAMs is provided as standard (typical retention time is two months). The recharging circuitry operates whenever the Ramrom 15 is used, and may be enabled or disabled by setting a link on the board. An optional 5v power adap-

16 SOCKET ROM/RAM EXTENSION BOARD
+, 32K PLUG IN RAM CARD

Fully buffered the board offers the following features:

All 16 sockets may contain 8K or 16K roms.

Up to two pairs of sockets may be configured to accept 8K eproms to simulate a 16K eprom without the expense of a 27128.

Up to 16K of CMOS RAM type 6116LP (made up of 8 2K ram chips) may be fitted to 8 of the available sockets leaving 8 free for roms.

or 2 8K Ram chips (6264) leaving 14 available sockets.

The advantage of sideways ram is twofold:

1. Programs can be assembled directly to hex 8000 and debugged before being committed to eprom.
2. Programs intended for sideways roms may be stored on disc and downloaded into ram. Many more programs may be kept on disc allowing the extension board to be fitted only with roms that need to be resident.

This is a high quality PTH board and plugs into the extreme right hand rom socket.

4 wires to the paging register and one lead to the R/W line have to be connected.

BATTERY BACK-UP FACILITY
Separate power leads for the board

are used to eliminate possible crashes that may occur due to trying to draw up to 650mA from a sideways rom socket.

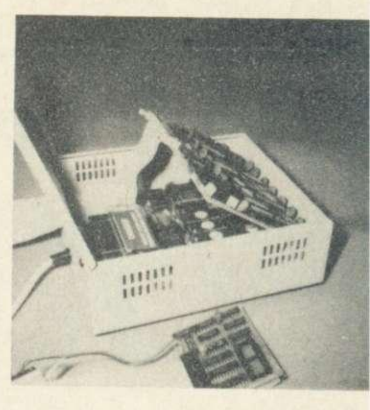
Board fully assembled and tested complete with full installation and operating instructions.

Cost £32.00 + VAT, £1.00 P&P
Also available: 32K plug in RAM card. Will fit directly into ROM socket on above board.

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CHELMSFORD, ESSEX CM2 6ES
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THE NEW EXTERNAL 28 ROM EXPANSION SYSTEM FROM HCR ELECTRONICS



This extremely powerful but versatile machine has the capability of: 32K RAM & 24 sockets available for ROM *or* many various combinations to your personal requirements.
This machine has its own separate power supply which eliminates drain on the BBC's switched mode supply.
NO SOLDERING IS REQUIRED.

The unit consists of two modules:
1. An adaptor board to plug into the BBC sidways Rom socket 15.
2. The expansion case.

The case comes complete with an inbuilt power supply and one expansion card. This card will hold 12 Roms or a combination of Ram/Rom (Ram can be 6116's, 2016's or 6264's). This gives a total of 16 Roms (including four in machine).
A second board identical to the above can be fitted at a later date, giving a total capability of 28 available sockets for Rom or Ram.
The second board can be selected as an alternative to the first board, either by a switch on the case *or* via software control.

SOME ADVANTAGES
1. No soldering required.
2. No access into machine required after initial fitting.
3. No overheating problems.
4. Does not physically interfere with other internal expansion add-ons.
5. Built in power supply (does not overload BBC's supply).
6. Computer will still function with external box powered down or unplugged (using Roms resident in machine).
7. Will make available 32K Ram plus 24 Rom sockets at a varied combination to the customer's needs.

Cost unit complete with one board £75.00 + vat. Second board £29.00 + vat. Postage & Packing £3.00







The Ultimate Tape to Disc System....

THE MOST EFFECTIVE TRANSFER UTILITY CURRENTLY* AVAILABLE, OR YOUR MONEY BACK!

...for BBC ‹B›

This system is ROM based and has the following features:

- Instant access.
- Allows use of all available RAM, (&4ØØ to &7FFF).
- Can handle any length of program.
- Can handle any number of programs.
- Can save to any disc.
- Very user-friendly, (menu driven).
- Contains two transfer routines to ensure effective loading of all but a few currently available software tapes.
- Adventures normally taking six minutes to load will now take about five seconds.
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••••• PRICE £18.00 (including V.A.T. and post) •••••

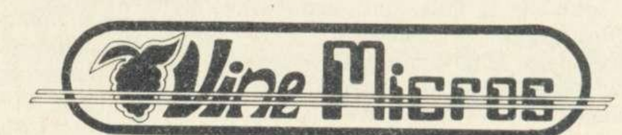
At present available for the BBC 'B' O.S. 1.20 with single density interfaces using the standard 8271 chip (e.g. Acorn, Amcom S/D, Watford S/D).

* Month of issue.

N.B. This ROM solely provides convenience in loading, and does not break software protection.

Also: The **ADDCOMM** ROM
40 new commands for the BBC 'B' O.S. 1.20 and Electron computer with ROM board. GRAPHICS, TOOLKIT, LOGO GRAPHICS and GENERAL PURPOSE statements all on one ROM.

£28.00 with 72 page User Guide, (including V.A.T. and post).
Or send stamp for detailed brochure.



Available from:

VINE MICROS, MARSHBOROUGH,
NR. SANDWICH, KENT,
CT13 0PG.

(Or your local Computer Dealer)

tor (£5.75 inc VAT) may be used to power the board if required. A red LED indicates that the board is 'on'.

Expensive it may be, but for those who want an expansion board of the highest specification, the Ramrom 15 will not disappoint. It seems to work happily with almost any other expansion options, eg, the Aries B20 video RAM expansion board and double density disc controllers.

Exprom

The Exprom successfully combines both external and internal mounting, and its design and construction are of a very high standard. If it's facilities you want from your ROM board then the Exprom has more options than any other board I have seen. Up to 16k of paged RAM is available in socket 0. This is really four contiguous sockets which may be populated with various 2k and 8k RAM chips and/or EPROMs in a number of combinations; 2, 4, 8 or 16k EPROMs may be used in any of the sockets. A maximum of 16 devices may be accommodated, with a link for each socket to enable a 'wait state' for EPROMs slower than the normal 250ns.

The standard board has two toggle switches mounted on its rear edge, which allow sockets 14 and 15 to be disabled. A further two switches, to disable sockets 12 and 13, may be added at the time of purchase, and these protrude through the rear ventilation slot in the BBC micro. As a further option, a ZIF socket may be mounted in socket 4 position to allow EPROMs to be inserted without risk of damage.

Installation requires the 6502 to be mounted on the Exprom board. It is replaced by a DIL header plug and a ribbon cable connected to the Exprom board. One flying lead is connected to the S19 link on the BBC board. The Exprom board is provided with two sets of pillars, and when mounted internally, is extremely stable. Four pillars may be placed on the Beeb's lid to facilitate external mounting. The instructions in the excellent 21-page manual are comprehensive and clear.

My only criticism of this otherwise superb board is the slight difficulty encountered in removing ROMs, due to the number of links nearby. However, the use of turned pin sockets makes the task reasonably straightforward. Overall, the Exprom expansion board is a high-quality product at a reasonable price, and should be considered even if you do not need all the extra facilities.

Midwich

One of the least sophisticated ROM boards comes from the Midwich Computer Company. It provides 16 ROM sockets but no RAM options, and is long, narrow and tends to flex when ROMs are inserted. As it is mounted under the keyboard edge, it successfully avoids the Beeb's RAM area.

Installation can be rather difficult as

WHAT THEY OFFER

	RAMROM 15	EXPROM	ALTAIR APEX	ARIES B12	RAMAMP	MIDWICH
RAM or ROM	RAM/ROM	RAM/ROM	RAM/ROM	RAM/ROM	RAM/ROM	ROM
ROM sockets available	11 or 10+1 RAM position (plus 4 on BBC board)	16 or 15 + 1 RAM position. Wait states may be selected for 'slow' EPROMs	11 + 2 RAM positions or 12 + 1 RAM position (plus 4 on BBC board)	12 (socket 0 reserved for RAM)	6 (plus 4 on BBC board)	16
RAM available	2k, 4k, 8k, 16k options + rechargeable battery back-up and several configurations (separate power supply available)	2k, 4k, 8k, 16k options (able to be mixed with EPROMs)	16k as 2 × 8k CMOS (6264) static RAMs 8k as 1 × 8k CMOS RAM. rechargeable battery back-up	16k as 2 × 8k CMOS (6264) static RAMs or 8k as 1 × 8k CMOS RAM chip	16k or 32k dynamic RAM on board	–
Installation	Plug in driver board (main board external)	Plug in (may be mounted externally)	Plug in (internal only)	Plug in (can be mounted externally). CPU carrier board £5.75 extra	Plug in (internal)	Plug in (may require soldering) internal
Price	£129	£59.95 (basic) £80.50 (fully expanded)	£57	£46	£56 (16k RAM) £67 (32k RAM)	£27
Software provided	6 utility programs	–	–	–	10 utilities	–
Available from	GCC (Cambridge), 66 High St, Sawston, Cambridge CB2 4BS	Anderson Electronics, 2 Hollin Park Rd, Calverley, Pudsey, West Yorkshire LS28 5PU	Altair Electronics, 1 Cherry Walk, Hayes, Bromley, Kent BR2 7LT	Aries Computers, Science Park, Milton Road, Cambridge CB4 4BH	Twillstar Computers, 17 Regina Road, Southall, Middlesex	Midwich Computer Co, Silray Road, Diss, Norfolk IP22 3EU

HOW THEY SCORE

	Ramrom 15	Exprom	Aries B12	Altair Apex	Ramamp 32k	Midwich
Design	5	5	4	3	4	2
Construction	5	5	5	4	4	2
Ease of Installation	5	4	4	3	4	2
Ease of chip removal/insertion	4	3	4	3	4	2
Versatility	5	5	4	3	5	3
Software provided	4	–	–	–	5	–
Documentation	5	5	5	3	3	2
Value for money	4	5	4	4	5	2

5 Excellent, 4 Good, 3 Satisfactory, 2 Poor, 1 Very Bad

the board is located in both the right hand ROM socket and the IC76 socket. If, like mine, your IC76 is well and truly soldered in, you have a choice – take your computer to a dealer or attempt a major soldering job with its risks.

No manual is provided, just the briefest of instructions on the back of the box. However, a spare 74LS163 chip and its socket are included. As each ROM socket is located very close to its neighbours, I encountered further problems when removing ROMs from the middle of the board.

For anyone who requires a ROM expansion board with no frills and has IC76 socketed in his/her computer, then the Midwich may be the answer, but I find the design and quality of this board leave a lot to be desired.

Altair Apex

The Altair Apex board also accommodates 16 devices, but unlike the Midwich, it utilises the Beeb's four resident sockets. The 13 sockets available may be configured as 12 ROMs and 8k of RAM, or 11 ROMs and 16k of RAM. Only 8k devices may be used, occupying the lowest priority sockets (0a + 0b). The BBC micro's ROM sockets take the highest priority.

The Apex plugs directly into the 6502 CPU and 8271 FDC (floppy disc controller) sockets. These two ICs are then inserted into corresponding sockets on the Apex. Four flying leads are connected to links S20, S21 and S22, and four power leads on the BBC's board need to be carefully bent down to accommodate the Apex. This rather awkward method of connection could be avoided if a pair of 40-pin sockets were inserted to raise the expansion board slightly. As a good portion of the board lies over the Beeb's RAM area, additional sockets would also help minimise overheating.

The lack of a rear support results in instability when inserting chips, and I found that the 40-pin sockets tend to spring out at the front. As the Apex board occupies so much space, there may be no room left for other expansion options like video memory boards or double density disc controllers.

The rechargeable battery back-up facility is certainly a big plus for this board. The RAM locations can also be latched for read/write operations using a *FX call. An optional LED glows red/green alternately to indicate the RAM's status. Documentation – five photocopied pages – is just adequate.

Aries B12

The Aries B12 package comprises two boards – a ROM carrier and a buffering/decoding board. A CPU carrier board is also available for an extra £5.75 if you do not have an Aries B20. The quality of the design and construction is high and the system uses a plug-in-and-go approach.

The CPU is removed and inserted on the B20 (or alternative carrier board). The buffering/decoding board straddles the Beeb's sideways ROM sockets and the B12 may be mounted either externally or on the underside of the computer's lid. Twelve ROM sockets and 16k of paged RAM are provided on the ROM board. The BBC's four ROM sockets cannot be used. Sockets 0a and 0b on the B12 provide space for 2 × 8k CMOS RAMs (the lowest priority position).

The strengths of this system lie in its ease of installation, reliability, sensible number of ROM sockets and its ability to interface with the Aries B20 video RAM expansion board. In this configuration the system represents an excellent and cost-effective means of upgrading the Beeb's RAM and sideways facilities – an attractive alternative to the 6502 second processor. A recent development has been the production of a modified buffer/decoding board to allow a Solidisk 32k sideways RAM board to be included in the B12/B20 combination.

If you wish to use sideways RAM to the full, any of these boards represent an expensive option. Two 8k 6264 CMOS chips will set you back a cool £50 – £60 for the privilege of one 16k sideways RAM location. It is here that the Ramamp boards score heavily.

Ramamp

Using a configuration of 16k or 32k of dynamic RAM, Ramamp offer two boards and each represents a low-cost means of obtaining sideways RAM. Six on-board ROM slots, plus the four in the Beeb, give a maximum of 10 ROMs. This deliberate policy of Ramamp Computers ensures the Beeb's power supply is not overtaxed, thus enabling a disc drive, an Aries B20 board or a user-port peripheral like the AMX Mouse to be driven reliably.

The board sits in the OS 1.2 socket, this chip being moved onto Ramamp's corresponding socket. Installation is a simple matter of plugging two flying leads into link S21 and the Tube socket respectively (people with second processors will have to make other arrangements for the Tube connection). Like the Midwich board, it sits just below the edge of the keyboard, thus avoiding the Beeb's RAM area.

The Ramamp board proved very flexible in use. The comprehensive range of software provided makes full use of the one or two RAM slots available. The RAMPDFS and printer buffer programs proved very useful. The former program sets PAGE to &E00 for disc users, reclaiming 2.8k of memory. The latter programs set up 15k and 7k printer buffers respectively. The 7k buffer is very clever, utilising the 'top' 8k of a RAM slot already occupied by an 8k language ROM.

Ramamp Computers has produced two excellent boards which give a near-perfect solution if you require sideways RAM for your language firmware, but also want a number of service ROMs permanently present in your machine.

Making a choice

All the boards discussed provide various solutions to the BBC micro's lack of ROM sockets. My choice? It is hard to separate the Ramrom 15, Exprom, Aries B12 and the Ramamp 32k, as each is an excellent product. Perhaps the Aries B12 and the Ramamp are the best all-rounders, though the Altair Apex is worthy of consideration if battery back-up is important to you. The Ramrom 15 and the Exprom are in a class of their own, but you must judge whether you are likely to make sufficient use of the extra facilities to justify the additional cost.



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1984


NEW 16K EPROM
*HEX, Is a full HEX dump, displaying 8 bytes of HEX and ASCII equivalent per line. A status line shows the current address and the byte at this address in:- HEX, ASCII, Decimal and either the binary, basic token or assembler mnemonic. Forward and reverse scrolling of the display at normal and high speeds is a feature, as is a full on screen memory editing facility which allows inputs in either hexadecimal, ASCII characters or assembler mnemonics.
*MON, Serves the same function as *HEX, but the display is in disassembled opcodes, rather than *HEX. The editing and scrolling facilties are the same as for *HEX. An additional feature of *MON is the ability to directly follow JSR's, branch's etc.
*DEBUG, A full featured program debugging aid, allowing the programmer to see the most intimate details of the program under examination. Features, variable speed, single stepping, breakpoints, continuously updated disassembler, selective HEX dumps (up to 6) plus current stack, all continuously displayed on screen, plus many other features.
*DISCED, A comprehensive disc sector editor enabling any sector of a disc to be read, inspected, edited and written back. It will work with any 40, 80 or dual formatted single density disc.
*DGET, Searches a disc for all occurances of a string or group of bytes.
*REL, Enables machine code to be easily moved around in memory, automatically adjusting JSR's, JMP's etc.
*SLOW, This command causes the entire computer to slow down to any variable speed between 1 and 255. This can allow the in depth study of graphic's methods etc.
*EDIT, A dynamic basic screen editor, cursor controlled with full forward/reverse scrolling of listing, incorporating insert/delete lines, insert/overwrite characters, enter line from any position after editing.
"No need to Sweat! Let me be your slave."
*REF, Produces a cross-reference listing of the current basic program. All variable names are listed (WITHOUT HAVING TO RUN THE PROGRAM!) in alphabetical order followed by the line numbers on which they are referenced. Numeric items can also be crossed referenced if desired.
*SORT, A built in sort routine allowing any single dimension array, be it integer, real or string, to be sorted.
BASIC COMMAND LIST:- *PROG, *BAD, *EXTEND, *PACK, *SORT, *PAGE, *ENVELOPE, *FIND, *REPLACE, *XREF, *TRON, *TROFF, *CHAR, *EDIT, *EDKEY.
MACHINE CODE COMMAND LIST:- *MCODE, *MOVE, *CROM, *SLOW, *GET, *PHEX, *GO, *MON, *HEX, *SPACE, *DGET, *DISCED, *DIS, *DEBUG, *CRC, *REL.
Designed with the serious programmer in mind, a 16K Eprom packed with a multitude of programmer friendly utilities, as with all SLAVE'S, SLAVE is instantly available and will obey an extensive range of commands. So why not invest in more muscle for your BEEB, and get some help with the heavy work!!! SLAVE has over 30 comprehensive machine code and basic tools.
"The Slave Drivers Guide."
A&F Software Ltd., Unit 8, Canal Side Ind. Est., Woodbine St East, Rochdale OL16 5LB
24 hrs HOTLINE 0706 341111
Slave is available direct from A&F Software Ltd for only £49.95. This includes post, packing, VAT, and User Guide.
Please send me a Slave, I enclose my cheque/PO for £49.95.
Cheque N°. ______ Please debit my Access/Visa N°. ______
Name ______
Address ______
Telephone: ______
A&F NULLI SECUNDUS SOFTWARE
Remittance to:- A&F Software Ltd., Unit 8, Canal Side Ind. Est., Woodbine St East, Rochdale OL16 5LB
Please allow 14 days for delivery.

Any improvement on Britain's No.1 word processing ROM...

WORDWISE was the very first ROM based product to be made available for the BBC computer and over the last couple of years it has become the most popular word processing system for the BBC machine with almost 50,000 chips now sold.

It has consistently received excellent reviews for its ease of use and speed. It takes only minutes for the user to become familiar with a powerful professional word processing system.



WORDWISE PLUS is now available extending the original program in many unique directions. Not only is the program now twice the size but the package includes two completely new manuals—an introductory manual that gently introduces the newcomer to word processing with WORDWISE, and a reference manual listing all the commands.

THE WORDWISE PLUS PACKAGE CONTAINS

1. **16K ROM**
2. **SPIRAL BOUND REFERENCE MANUAL (180 pages)**
3. **INTRODUCTORY MANUAL (56 pages)**
4. **KEYSTRIP**
5. **TYPING TUTOR PROGRAM (On cassette)**
6. **EXAMPLE TEXT (On cassette)**
7. **EXAMPLE PROGRAMS enabling mail merging, index generation, etc.**

WORDWISE PLUS is completely compatible with all older versions and is able to use existing WORDWISE files without modification.

WORDWISE PLUS FEATURES

Over the last couple of years we have received countless suggestions for ways of extending or adding new facilities to WORDWISE. It soon became obvious that we would not be able to implement every single suggestion. Indeed, each person uses a word processor in a different way—each individual has differing requirements—a feature that one person may think essential another may have no need for.

We have overcome this problem in two ways. Firstly we have included the most commonly requested additions and improvements. A number of new editing features and a few more embedded commands have been added.

Secondly a unique BASIC-like programming language has been incorporated. This facility enables the capabilities of this word processor to be extended in an infinite number of ways.

The language itself has been designed, like WORDWISE, to be simple to use and understand. Many of the commands look and act like BASIC commands and so will be familiar to many users. However the language can control and use all the functions of the word processor and can control any aspect of WORDWISE PLUS.

There are over 95 commands and functions in the language alone, including numeric and string variables and random access file handling. Up to 10 separate programs may be held in memory at once and of course all the normal WORDWISE editing facilities are available to enter and alter the programs.

At the simplest level this language could be used to add new editing features. However more complex and powerful programs can of course be written. Four useful examples are supplied with the WORDWISE PLUS package.

1) A mail merging program.
2) An index generating program.
3) Two column text printout.
4) Continuous processing.

```
WORDWISE-PLUS
(C) Computer Concepts 1984

1) Save entire text
2) Load new text
3) Save marked text
4) Load text to cursor
5) Search and Replace
6) Print text
7) Preview text
8) Spool text
9) Segment menu

ESC Edit Mode

Please enter choice_
```

Wordwise Plus
The word processor for the BBC micro

Wordwise Plus Plus
REFERENCE MANUAL
by JOHN COLL and ANDREW MYERS
Computer Concepts

Introduction to Wordwise Plus Plus
by JACQUETTA MEGARRY
Computer Concepts

...Must Be A Plus

Word Processing With Wordwise

All the advantages of a ROM—instantly available. One command and your BBC machine becomes a powerful word processing system.

Fast and very simple to use.

The more complex commands are menu driven, enabling those totally unfamiliar with this software to use these more powerful features straightaway.

The function keys are used to full effect with a keystrip clearly showing each function.

Block copies and moves. It is possible to mark any part of your text, this marked section may be instantly moved or copied to any other part of your text. This cut and paste type of operation is a vital part of all word processing operations and with WORDWISE it is simplicity itself.

Automatic headings, footings and page numbering. When printing a document many pages long it is possible to have WORDWISE number the pages for you and put any heading or footing line on each page.

Unique word counting feature. Ideal for journalists, it constantly displays the current number of words typed. It also allows word counting for specific sections of a document.

Works with all filing systems, such as DISC., CASSETTE., and the new ADFS. Works with any printer that works with the BBC machine (most do) and is able to access the special features of any printer (italic, subscripts, etc.). There is no need to buy additional printer driver programs.

Here are a few of the things that have been said about WORDWISE.

"WORDWISE offers an extremely user friendly program . . . it would make an excellent choice for someone rather apprehensive about word processing."
. . . E & CM

"WORDWISE has won a devoted fan club because of its flexibility and ease of use."
. . . Practical Computing

"On the whole WORDWISE is an excellent wordprocessor . . .WORDWISE is thoroughly recommended."
. . . VIEWFAX 258

"WORDWISE is straightforward, friendly and excellent value."
. . . Practical Computing

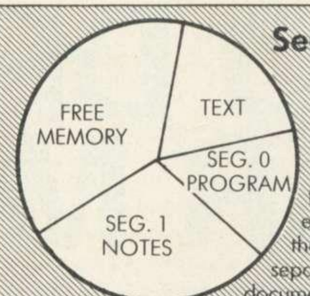
". . . it is ideal for the home hobbiest and small businessman."
. . . A & B Computing

Word Processing with Wordwise Plus

WORDWISE PLUS still has WORDWISE as its core therefore it is still very user friendly and retains all the features that made WORDWISE the most popular word processor. It now has many new additions making this the most flexible word processor yet.

WORDWISE will continue to be sold alongside WORDWISE PLUS. For those more specialised users who require the added flexibility here are a few of the new features.

Segments



When using WORDWISE PLUS, the BBC's memory is divided between your text and up to 10 'segments'. Each segment may contain either a program or just normal text. It is therefore possible to store and edit up to 11 separate documents in memory, or 1 document and 10 programs, or any mixture.

Often when writing letter or articles it is useful to keep a notepad, outlining what you intend to write. In WORDWISE PLUS one of the segments could be reserved for an electronic notepad. It would be a simple matter to switch your 'notepad' and your main document with just a single key press.

Some of the New Editing, Embedded Commands and Wordwise Extensions

WORDWISE PLUS works with the 6502 2nd processor. This allows more text to be stored in memory and 80 column previewing no matter how full memory is.

New embedded command FI will fully indent text against the right margin.

New commands for underlining and bold printing. The bold and underline effects are shown on screen—and it is a simple matter to configure these features for any printer.

Saving and loading of text is now up to 10 times faster on disc, and now the computer gives the user a warning if a document is going to be overwritten on the disc or in memory.

There is now a working filename—i.e. WORDWISE remembers the name of the current document being worked on.

New command deletes markers automatically.

It is now possible to print or preview a file directly from disc without having to load it first.

New embedded command 'PS' allows strings to be inserted into the text when it is printed.

New embedded command 'PF' will read a document from file when printing and interpret any embedded command in that file.

Improved search and replace facilities now include wild-cards.

Example Programs Supplied With Wordwise Plus

1) A mail merging program that allows names and addresses to be added to a standard letter. This is a relatively easy job with this language.

2) An index generating program. This finds keywords and generates a separate index listing the word and the page numbers where the keywords occurred.

3) Two column printout. This program will print your text in two columns across the page.

4) Continuous processing. This enables the disc user to process and edit extremely large documents spread over several files as if it were one continuous document in memory.

Upgrades

WORDWISE PLUS for only £17+VAT.

Existing users of WORDWISE can upgrade to WORDWISE PLUS for £17+VAT (£19.55). We are only able to offer this service through ourselves at the address below. Please return the old WORDWISE package complete with chip (suitably protected for postage) and the manual with your cheque or P.O. or quote your Access or Barclaycard number. We will then send you the complete new package.

In The Near Future

HI-WORDWISE for 2nd processors that allows even more user memory, supplied on disc for less than £5 to WORDWISE PLUS owner.

A FAST SPELLING CHECKING PROGRAM.

Both WORDWISE and WORDWISE PLUS are available from all good computer dealers. Alternatively you can obtain these directly from Computer Concepts.

WORDWISE PLUS £49+VAT (£56.35)
WORDWISE £39+VAT (£44.85)



Computer Concepts, Gaddesden Place,
Hemel Hempstead, Herts HP2 6EX
Telephone: (0442) 63933





SMART WAYS TO DRIVE YOUR MODEM

Jeff Ashurst follows up his review of modem hardware by assessing some of the software support around

YOU NEED software to drive the modems reviewed in the February issue, and this month I'll look at what facilities such software offers and to what degree it is portable.

Dumb

So-called 'dumb' terminal software, as its name implies, does not perform any fancy tricks – it simply takes characters from the keyboard buffer and directs them to the RS423 output buffer. It also brings incoming characters from the RS423 input buffer and displays them on the screen. This is the minimum – and the cheapest – requirement for communication. Typical uses of a dumb routine are user-to-user dialogue with another modem owner and message-swapping through a bulletin board.



This type of program is a good way to start if you're not sure what other facilities you might need. Various publications have carried listings of such routines for you to key in, and books are another source. Two I can think of off hand are those by Paul Beverley in *Acorn User*, November 1982, and by Mike James in his book *The BBC micro – an expert guide*.

You could, of course, write your own – it's not all that difficult if you know a few things about programming.

Smart

Intelligent or smart software offers facilities in addition to the straightforward reading and writing of characters. You'll find a list of features in the packages reviewed in the summary tables, and these include protocol selection, the use of a buffer area in memory, uploading and downloading programs and file transfer with sophisticated error-checking techniques.

Two of these concepts are fundamental to the action of smart software. First the use of a buffer, which is normally all the free memory. Instead of all the communication process being an interactive, on-line affair, the buffer area is used as a clearing house for information. The information is handled as a file – and this is the second concept. A file is simply a collection of characters; it can be a program, a message or document, a standard series of responses to log-on to a host system or anything else you choose.

Some software goes further and also incorporates configuration commands for specific modems. Thus in some cases the connection from the RS423 interface to the modem (see figure 1, page 169, February issue) is not only used for data, but also for instructions between the computer and the modem. The SCM-100 reviewed keeps these

HOW THEY SCORE

	Acorn	Commstar	Modrom	Watford	OEL	Protek
Range of features	9	9	6	5	5	6
Documentation	8	9	6	5	4	1
Messages/Prompts	9	7	8	5	7	5
File/Program send	–	9	–	8	5	5
Prestel capability	9	7	7	–	–	5
Overall usability	8	8	7	6	5	5
Total (out of 60)	43	49	34	29	26	27

SUPPLIERS AND PRICES

Watford User-to-User Rom (£18 plus VAT)
Watford Electronics, 250 High Street, Watford, Herts. Tel: (0923) 40588/37774.

Modrom*
Loco Systems, 5 Stainton Walk, Goldsworth Park, Woking, Surrey GU23 1JB. Tel: (04862) 4480.

Acorn's Prestel ROM (available only as part of a package with the Prestel Adapter at £113.85 inc. VAT)
Acorn Computers, Fulbourn Road, Cherry Hinton, Cambridge CB1 4JN. Tel: (0223) 245200.

Commstar (£29.57 plus VAT)
Pace Software, 92 New Cross Street, Bradford BD5 8BS. Tel: (0274) 729306.

Protek's BBC Modem Pack (£19.95 inc. VAT)
Protek Computing, 1A Young Square, Brucefield Industrial Park, Livingston, West Lothian EH54 9BX. Tel: (0506) 415353.

OEL User-to-User Software (£19.95 inc. VAT)
OEL, North Point, Gilwilly Industrial Estate, Penrith, Cumbria CA11 9BN. Tel: (0768) 66748.

*We cannot give a price for this product as we have been unable to obtain a reply from Loco Systems' phone number

functions separate by sending instructions via the BBC micro's user port. Any software which configures the hardware as well as handling the data is arguably more sophisticated, but on the other hand it is not likely to be compatible with any modem other than the one it was designed for.



It would be simplistic to judge the software on an 'A is better than B' level. It's more realistic to consider A and B as different, and then decide, on the basis of features provided and method of operation, which is the most suitable for a particular application.

Interface standards

As with the modem standards, different interface standards have been adopted by the United States from the rest of the world. Fortunately, compatibility between the two sets of interface standards is better than that between modems, and probably more people in the UK are familiar with the US terminology than any other.

The world standards are laid down in the list of Consultative Committee for International Telegraph and Telephone (CCITT) V-series recommendations. Standard V24 defines functional details and V28 and V10 specify electrical characteristics. In the US member manufacturers make up the Electronics Industries Association (EIA), which publishes, through its Technical Committee TR30, its Recommended Standards, the RS series. These standards equate thus:

V24 + V28 = RS232 − C
V24 + V10 = RS423 − A

Both RS and V-series standards specify signals on 25 pins at the interface, but in practice this is implemented by only a few manufacturers of popular micros.

So 'compatibility' has a fairly loose definition when applied to communications.

XON/XOFF and XMODEM

A few words now about the X's. 'XON' and 'XOFF' are simply communications jargon for the signals which instruct the other end to recommence or stop transmitting. They are the ASCII codes generated by the key combinations CTRL-Q and CTRL-S respectively, and can be sent as such. You send them from the keyboard to make an incoming file pause while you read the screen, and smart software sends them automatically to control flow as your computer's RS423 input buffer empties and fills.

'XMODEM' is a sophisticated error-checking file-transfer protocol developed by Ward Christiensen, initially for use with CP/M systems. A file is transmitted in blocks, together with a checksum calculated for each block, and at its destination the checksum is again calculated, based on the data as received. If the two do not match, the block is automatically requested again. This process is repeated, if necessary, up to ten times, after which the sender is given the option to retry or quit. XMODEM can ensure successful file transfer under extremely adverse conditions. If your software has this facility, you can use it with other terminals or hosts which support this protocol, such as terminals running similar software, bulletin boards and CP/M systems.

	Commstar	Modrom	Watford
set word format	●		
set transmission speed	●	●	
set on/off – echo	●		
filter	●		
line feed	●		
printer	●		
clock	●	●	
buffer – copy to	●	●	●
load	●		●
output	●		●
save	●		●
reset pointer	●		●
view	●	●	
wipe	●		●
disc/buffer option	●		
chat mode	●	●	●
copy mode			●
select screen mode	●	●	
XON/XOFF protocol option	●	●	
file transfer in XMODEM	●		
terminal emulation	●		
modem test sequence		●	
auto dial with repeat		●	
auto answer		●	
accept MOS commands	●	●	●
handle wp files	●	●	●

Table 1. What the terminal/user-to-user ROMs offer

Calls

Two of the routines in ROM to access Prestel use the same call − *PRESTEL. It is, of course, unlikely that you would have two viewdata ROMs installed in everyday usage, but the problem of clashing call names could well occur between other ROMs. It's worth noting, therefore, that there is a simple way of choosing your ROM by de-selecting the others. The command ?(673 + n) = 0 will disable ROM socket number 'n'. In a standard model B the four ROM sockets are numbered 15, 14, 13 and 12 from right to left looking from the front of the computer, with priority from the right. As an example, to disable ROM socket 14 you should issue the command ?687 = 0. The socket remains disabled until the Break key is pressed.

	Acorn	Commstar	Modrom
auto dial	●		●
auto repeat dial			●
save frame to disc	●	●	●
tag/retrieve frame	●	●	
hold frame but log-off	●		
send Escape	●	●	●
edit frame	●		
prepare message off-line	●		
download telesoftware	●	●	●
accept MOS commands	●	●	●
use f-keys for commands	●	●	●

Table 2. What the Prestel ROMs offer

Table 3. What the cassettes offer

	OEL	Protek
Prestel access		●
user-to-user	●	●
chat mode		●
copy mode		●
accept MOS commands	●	●
use f-keys for commands	●	●
download telesoftware		●
save frame to disc		●
tag/retrieve frame		
prepare message off-line	●	
exchange programs/files	●	●

ROMs

There are basically two types of firmware produced for the BBC micro: language and utility ROMs. The former include not only computer languages proper, but also things such as word processors. Given the chance, they will take over the operating system at switch-on or hard break, ie the computer will boot up in the first 'language'



it meets, working from highest priority socket number 15 downwards. Utility ROMs, on the other hand, such as the various toolkit or programmers' aid chips reviewed in *AU* in October 1984, are designed to be called from within a language. Of the four ROMs examined, Acorn's behaves as a language, whereas the others are utilities.

Commstar

Pace's *Commstar* is an exceedingly versatile piece of firmware. It's capabilities are far in excess of any one modem, which means that, given access to a suitable modem, it should be possible to communicate with almost any other system. This versatility is achieved by giving the user a set of facilities to configure in the software all the parameters of communication.

Commstar is menu driven, having a main menu plus a sub-menu entered from the Initialise command. The main menu is split into three areas. First there are seven commands (copy, reset, output, wipe, load, save and



view) which act upon the buffer. Below these the selection is of six parameters which include communications details like echo (of character to screen) and auto linefeed, plus a choice of screen mode and printer on/off. Several commands are repeated on the function keys so that, for example, the buffer and printer may be turned on and off from within a session.

The third area is of more fundamental selections. Here we find communications/Prestel, disc/buffer and the choice of chat mode or file transfer.

Also in this area is the initialise command which allows the user to set the number of data bits and stop bits, together with the word parity and the speeds of flow in both the receive and send channels. Separately, receive and send may be set to speeds from 75 to 9600 bits/second. The default speeds are 300/300 in terminal mode and 1200/75 for Prestel.

In Prestel mode, this chip has many of the features now standard in viewdata routines. You are allowed to tag and retrieve (ie, to mark and later jump back to) frames of interest, to copy frames to disc, to single-step forwards or look at previous frames and to download and save telesoftware. In terminal mode it supports the XMODEM file transfer protocol referred to earlier.

Commstar does not issue any discrete modem configuration commands. For this reason it should be compatible with most modems which do not expect or require such commands.

Modrom

This chip is supplied with the Loco Systems SCM-100 modem as a package. It contains, like two of the others, configuration commands specific to its own modem, yet it is tolerant of and capable of working alongside other communications software.

Unlike the other chips, which are summoned by one particular call word, this one has 14 different entry points. There is no *MODROM, command, but *HELP MODROM gives a list of 14 additional OS commands controlling the features of both the hardware and the software, and include *TALK and *PRESTEL, *Modrom*'s own terminal and viewdata routines.

In Talk, various options are available: screen mode 40 or 80 characters (mode 7 or mode 3); transmission speeds 300 or 1200 bits/second; and, to configure the SCM-100 modem, choice of originate or answer modes and UK or US frequencies. In the Prestel routine, of course, all these parameters are fixed. In both routines a screen display of the assignments of the function keys is available.

	Hardware					
	Acorn's Prestel Adapter	Nightingale	SCM-100	Watford/Telemod 2	OEL Pac-M1	Protek 1200
Acorn	●					
Commstar		●	●	●	●	
Modrom		●	●	●		
Watford				●		
OEL				●		
Protek						●

Table 4. Hardware/software compatibility

Auto-dial by the modem is selected by the *DIAL command, followed by the telephone number. If the suffix 'R' is added, it will keep dialling after an unsuccessful call until a modem tone is picked up. *DIAL may be used even with other software driving the modem.

There is a command to test the modem, *TEST, which sends 80 characters alternating *U*U*U..., causing much bit changing due to the ASCII codes for these characters. Other software commands put the modem on or off-line and show the current configuration, and *TIME shows the length of time on-line. The command *AA puts the modem into auto-answer mode, and needs to be used in conjunction with bulletin board software or other auto-answer routine supplied by the user. 179

The user manual covers all functions, but could be improved. All round I was very impressed by the Loco Systems package. I thought initially that a modem without switches was not particularly good news, but the ease of use of the software wiped away any such doubts.

Acorn's Prestel ROM

Acorn's sophisticated Prestel ROM is supplied as part of the Prestel Adapter package, a dedicated V23 viewdata facility which provides access to all Prestel's features and adds a few more.

The auto-dial capability of the modem is brought into play by the CALL command (on f3), which produces an invitation to enter the local Prestel telephone number. Prompt and status messages add a user-friendly touch. In fact, the Enter/Dialling/Waiting/On-line screen sequence plus the sounds from the modem's small speaker combine to provide full audible and visual monitoring of the dialling process. If you enter a phone number without switching on or even plugging in the hardware, the screen prompt 'Adaptor?' points you in the direction of your folly. (Note the spelling Adaptor in the software and Adapter on the hardware.)

The software makes extensive use of all 15 soft keys (f0-f9, cursor control and Copy), not only in 'immediate' mode but also with Shift, Control and Control-Shift. To help you keep track there is a keyboard strip and an on-screen Help menu which can be summoned up at any time in a session by f0, and the first-class user guide details all software commands together with those Prestel commands that have soft key equivalents.

Any Prestel frame of interest may be stored on tape or disc using Save Frame on f8. The software automatically creates a filename derived from the frame number, but the user has the option of overriding this and giving a different name before pressing Return to confirm the instruction – a user-friendly touch typical of this software. The associated load frame command retrieves the screen display from your filing system (disc or cassette), and can be used either to access stored information off-line or, in conjunction with Edit, to put a frame into the system for sending to someone's mailbox.

The Save/Edit/Load capability



makes this chip stand out from other Prestel offerings. The Edit command provides the facility to build a viewdata frame while off-line, using a blank message or greeting frame previously saved. Your composition completed, you go on-line and load frame, ready to send using the Prestel mailbox facility. The savings in call charges made possible by off-line working are obvious, and make this an attractive alternative to the telex service for business use.

Other commands allow you to download and subsequently save telesoftware programs and to print frames, and although there should be no problem with text, accurate reproduction of Prestel graphics is not normally possible. A substitute character such as an asterisk is produced by most printers.

Finally there is a whole series of configuration commands available to the user, enabling variation of such things as response delay and inter-digit dialling delay, but these are better left untouched unless you have problems.

Watford

This is unusual, being a user-to-user-only ROM. The company also issues this software on disc and cassette, but both of these require their Prestel ROM (£20 + VAT) to be fitted to the computer, whereas this version stands alone.

Completely function-key driven, the chip gives options of chat mode receive/transmit; file receive/transmit; buffer commands save, load and flush; exit to OS command and an interesting copy on/off function. Copy here means literally to copy the screen display from one BBC micro to another, giving the receiver a window on what you are doing. This function, toggled by f9, in effect issues a *FX 3,5 command (BBC micro *User Guide*, page 422).

The manual I received with my review copy was only provisional but includes instructions on transferring a file or program using chat mode for the parties to make arrangements to send/receive – both ends must be using the same software. I also noted with interest that f4 puts the modem and software into an idle state, allowing the phone to be used normally in the middle of a session.

CASSETTES

A direct comparison between ROM and cassette-based software is not fair as the speed and reliability even of discs – let alone tapes – cannot compete with the absolute convenience of firmware.

Protek

Protek's cassette-based BBC Modem Pack software runs in two modes – to access viewdata or for user-to-user communications via their portable acoustic modem.

Running the software produces a main menu of six items, which you can return to during a session using f0. The first option, Log On/Off, leads into the secondary menu of Log On, Change ID, Log Off options – all quite straightforward. Once on line to Prestel, you can work your way around in the normal manner or use the View, Print or Save Frame main menu choices, outlined in the documentation – which is very sparse. It can be argued, with some logic, that heavy documentation is inconsistent with a cordless, portable modem, but I do not feel that three small pieces of paper is good enough.

Back to the software – downloading and saving of telesoftware programs is catered for, although any program thus acquired overwrites the Prestel routine in Basic. To continue it is necessary to reload, after first saving your telesoftware, of course.



Option six on the main menu leads into user-to-user mode, switching the modems between originate and answer to give 1200/1200 half duplex communication. This mode gives a file transfer capability, for either a Basic program or a block of machine code, rather than an interactive 'chat' type dialogue. To transfer code, the software asks for start address and block size and gives the option of entering a relocation address for the receiver. Both computers do not have to be Beebs, but both must have Protek 1200 modems.

OEL

I tried OEL's user-to-user software for the Telemod 2 modem. Instructions for loading the tape program, appropriately named 'U2U', give a sequence using the Shift and Break keys, rather than the usual load command. A machine code routine, it lives in memory from &61AB to &7BFF.

This software switches the modem alternately between originate and answer to give a half duplex link for a



program or a block of machine code. Files are transferred in blocks with error checks, and up to three attempts are made, after which it is suggested that you redial.

Messages can be compiled off-line to keep telephone bills down. Compositions are then sent using CTRL-S. Other control key combinations include -B and -C, which turn the remote printer on and off and so allow a written message to be sent, and -E which sends the words 'END OF MESSAGE' and the code to switch the modems around. Both ends are advised of the status by alternate red and green squares on screen for transmit and receive.

SUMMING UP

So there we are. Four commroms, all very different, and two cassettes.

The message, if I dare say it again, is that they exhibit different strengths in various directions, and should be considered carefully in relation to your requirements. Don't be blinkered by your current needs – keep an eye on the future.

My view is that if you require only viewdata access and want to get the maximum usage out of Prestel, the Acorn ROM is the answer. If, however, your needs include Prestel access but also stretch to user-to-user communication, bulletin board use or even Telecom Gold, then you need multi-standard software, and for sheer flexibility, combined with the fact that you are not tied to any one modem, you can do no better than *Commstar*.

Of the cassettes, I prefer Protek's tape, which gives both Prestel and user-to-user access.

CLARES No1 IN UTILITY SOFTWARE!



BETA-BASE £25 DISC
8 GREAT FEATURES

WHAT IS A DATABASE?

It is a FILE which contains RECORDS. Records consist of a number of FIELDS containing the information—an analogy can be drawn with a card index in which a box of cards is the file. Each card is a record and each line on the card is a field.

SPECIFICATION

1) Random Access—disc based, single or dual drives
2) File Size—99K (40 track), 199K (80 track) —65,000 + records
3) Record Size—up to 2048 characters and 200 fields
4) Field Size—up to 254 characters with complete line scanning
5) Access any record using Primary Key in 2 seconds
6) Holds—1200 NAMES AND ADDRESS records on 100K disk
7) Search—500 records on 5 fields in 60 seconds
8) Sort—500 records on 3 fields in 60 seconds

SYSTEM FEATURES

●CALCULATE—using any valid expression and store results
●POWERFUL PRINTOUT OPTION—Eliminates need for separate mailing program, Parallel/Serial Printout allows setting of printer control codes, line spacing, tabulation, Headings etc, plus label printing with horizontal and vertical tab control.
●REDEFINE—Titles, field widths, number of fields, number of records etc.
●TRANSFER—Records from one file to another.
●SEARCH LISTS—Allow creation of sub-Databases within main Database.

NEW ✱

✱ GLOBALENTRY enables repetitive data to be typed in once and placed in as many records as required. Can also be used with a search list to provide a powerful global edit/update facility that will save hours of typing.
✱ SPOOLER enables you to create spooled files that are compatible with Wordwise, View and other word processors. You can therefore present your data within a document or in varying formats etc.
The spooler program will allow to format your spooled file in the same way as the print out option. You can therefore have headings, columns, titles, numbers etc.
✱ INPUT is a routine included on the disc which will allow you to write utilities for accessing your data and tailored specifically to your needs.
✱ TUBE compatible with the 6502 second processor.
✱ Comprehensive manual and tutorial.
All timings and sizes are relative to ACORN DFS. Compatible with ACORN DFS, WATFORD 1.3 and latest AMCOM DFS SERIES B.
✱ ORIGINAL USERS send your disc plus £3 for up grade.



REPLICA II: £12.00. DISC

The original REPLICA set a very high standard so the specification we set our chief programmer included some impossible features. In fact ACORN state that some of the things that we have done are impossible, it just took us longer that's all. REPLICA II transfers most cassette based programs to disk, even more than REPLICA. When you buy disk drives you do not have to throw away expensive cassette based programs.

REPLICA II transfers 'LOCKED' programs, programs loading as files, programs that load below &E00, those with up to 6 sections and those up to &6E in length eg adventure programs. No waiting for 6 minutes whilst adventure programs load.

REPLICA II is very easy to use. The user enters a name, how many sections and whether CHAIN,*RUN or *LOAD to load the first section. Press play and let the program do the rest, even a menu.
Think how much it will cost you to buy just 1 disk version of your favourite program—REPLICA II which will hold up to 16 programs, limited only by the disk capacity.

FX 80 PRINTER DRIVER £12.00

PRINTER DRIVER FOR EPSON FX80 AND VIEW
Multi-page driver with print menu allowing the setting of global (document wide) printer functions at printer initialisation.
The print menu program contains a sophisticated character generator which allows the construction of 95 user defined characters which are then accessible from VIEW via a highlight option.
Supplied on disc with comprehensive user manual.

NEW DISCDEX: £15.00 DISC

●Catalogues all your discs quickly and easily.
●Room to store four thousand titles.
●Quick search and load option.
●Compatible with single or dual drives.
●Extensive print options for catalogue and disc labels.
●Update and delete options.
●Supplied with stick on labels to number your discs and a supply of labels for printing your own disc labels.

DISCDEX is the answer to a disc users nightmare. How many times have you had to wade through your discs looking for the file that you know is there somewhere? Now with DISCDEX those days are gone.

DISCDEX will catalogue all your discs and store them in alphabetic order. In addition to the very useful search and load facility DISCDEX will also print out a full catalogue in alphabetic or disc order. Even more useful is the ability to print disc labels for sticking on the disc or the jacket.

DISCDEX is only suitable for discs with 31 file names as in the standard ACORN system. It is not suitable for double density interfaces.

Send for detailed newsletter.
All prices inclusive of VAT & Carriage—NO EXTRAS! Please state 40 or 80 track disc and state which D.F.S. you use

**Dept AU4
98 Middlewich Rd.,
Northwich, Cheshire CW9 7DA.
Tel: 0606 48511
Open 9—5pm Monday—Friday**

NEW ONESHOT: £12.00 DISC

●Full feature trace utility.
●Single step through BASIC program or halt at user determined interval.
●Print line number prior to execution.
●Obey fixed instructions before executing a line.
●Trace window allows screen to be seen whilst tracing execution.
●"Printer only" will force trace output to a printer allowing full screen display.
●Ability to dynamically alter control of ONESHOT.
●ONESHOT can be configured to run in any area of memory.

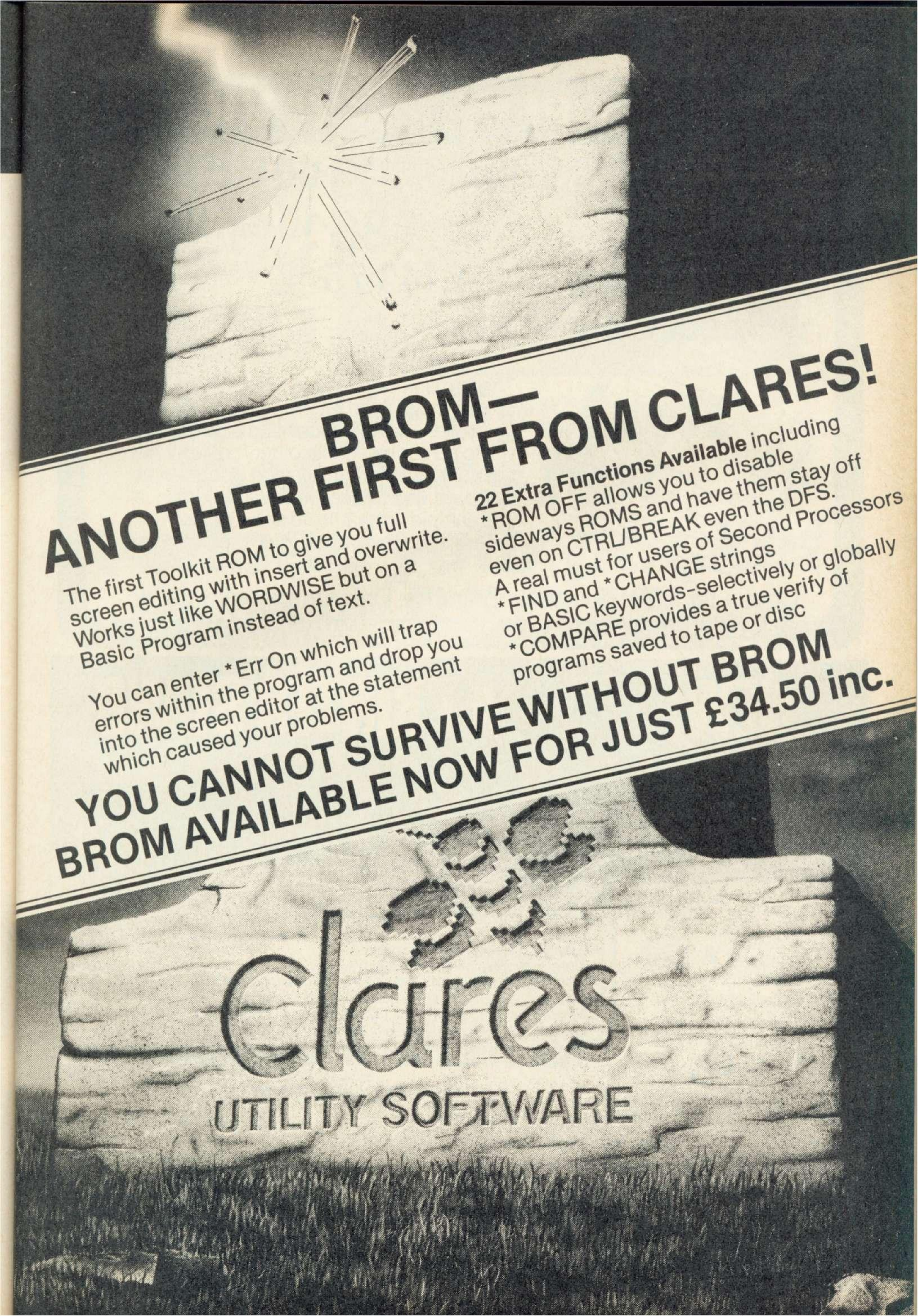
ONESHOT is a 1.25kb machine code program which gives the user several powerful aids in debugging BASIC programs. These include the ability to SINGLE STEP through the BASIC code of the target program, stopping the processing at specified points and comprehensive trace functions of the variables used by the target program.
A very powerful option allows the user to enter a command string into function key 0 and instruct ONESHOT to obey this command BEFORE each line is executed e.g. *KEY0 PRINT X%¦ M will print the value of X% before executing each line. This is a very simple example and it is possible to do much more complex things including printing the value of a variable only when it changes or when it reaches a certain value or falls within a certain range. This option can also be used to dynamically alter ONESHOT as it is working. The power of this option is only limited by the users ingenuity.
In addition to ONESHOT the disc also contains 3 very useful function key routines. The first will search for any DEFPROC or DEFFN and print the line numbers in which they appear together with the name of the procedure or function. The second will search for a specific procedure or function and print the line numbers containing it. The third routine will print out every active variable together with its present value.
ONESHOT is not compatible with double density interfaces.

NEW FUN HOUSE: £10.00 DISC

FUN HOUSE is a highly original suite of educational programs suitable for ages 3 to 13. The program is designed to encourage children to spell words which relate to objects found around the home. Animation and music are used to good effect and some highly original ideas are incorporated.
Each room exercise is terminated with a warning item e.g. the lounge finishes with 'FIRE' which goes on to engulf the whole lounge. Tests with a newly hired 4 year old resulted in us having to prise him away from the keyboard after 2 hours. In that time he had gone from never having used a keyboard to finding the location of all the keys very quickly and entering the correct answer. He had thus started on the path to learning spelling and familiarised himself with the keyboard including the use of DELETE to correct his mistakes. Can you afford not to give your children the same start?

FUN HOUSE is not compatible with double density interfaces.

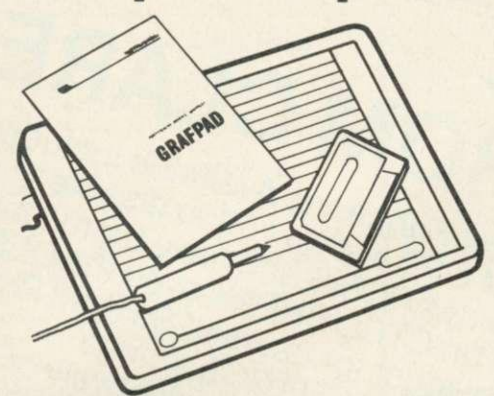
All Disc Software now available on 3" disc—add £3 to printed prices


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ANOTHER FIRST FROM CLARES!
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You can enter *Err On which will trap errors within the program and drop you into the screen editor at the statement which caused your problems.
22 Extra Functions Available including
*ROM OFF allows you to disable sideways ROMS and have them stay off even on CTRL/BREAK even the DFS.
A real must for users of Second Processors
*FIND and *CHANGE strings or BASIC keywords-selectively or globally
*COMPARE provides a true verify of programs saved to tape or disc
YOU CANNOT SURVIVE WITHOUT BROM
BROM AVAILABLE NOW FOR JUST £34.50 inc.
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UTILITY SOFTWARE

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* Scoop Viglen price £99·00 inc. VAT
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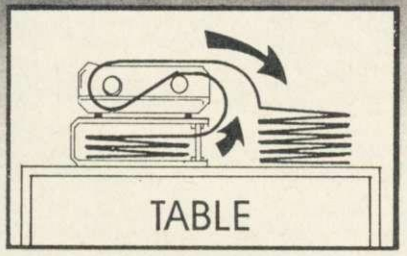
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The BBC Model B

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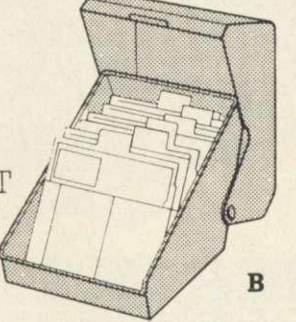
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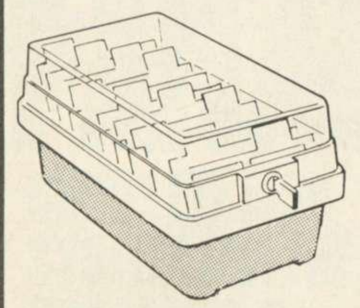
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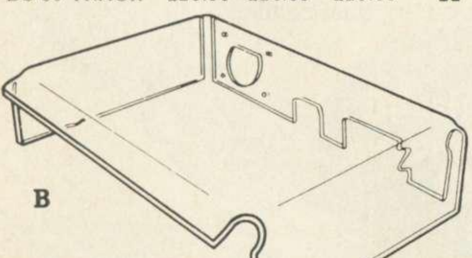
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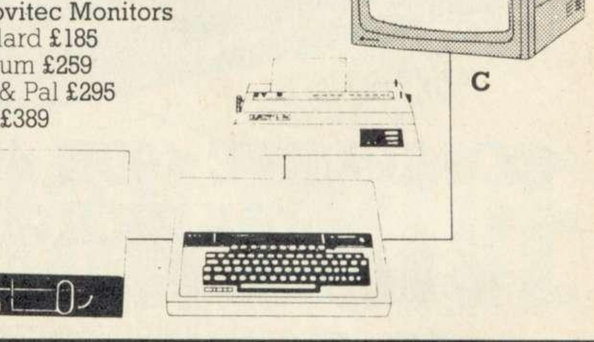
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C

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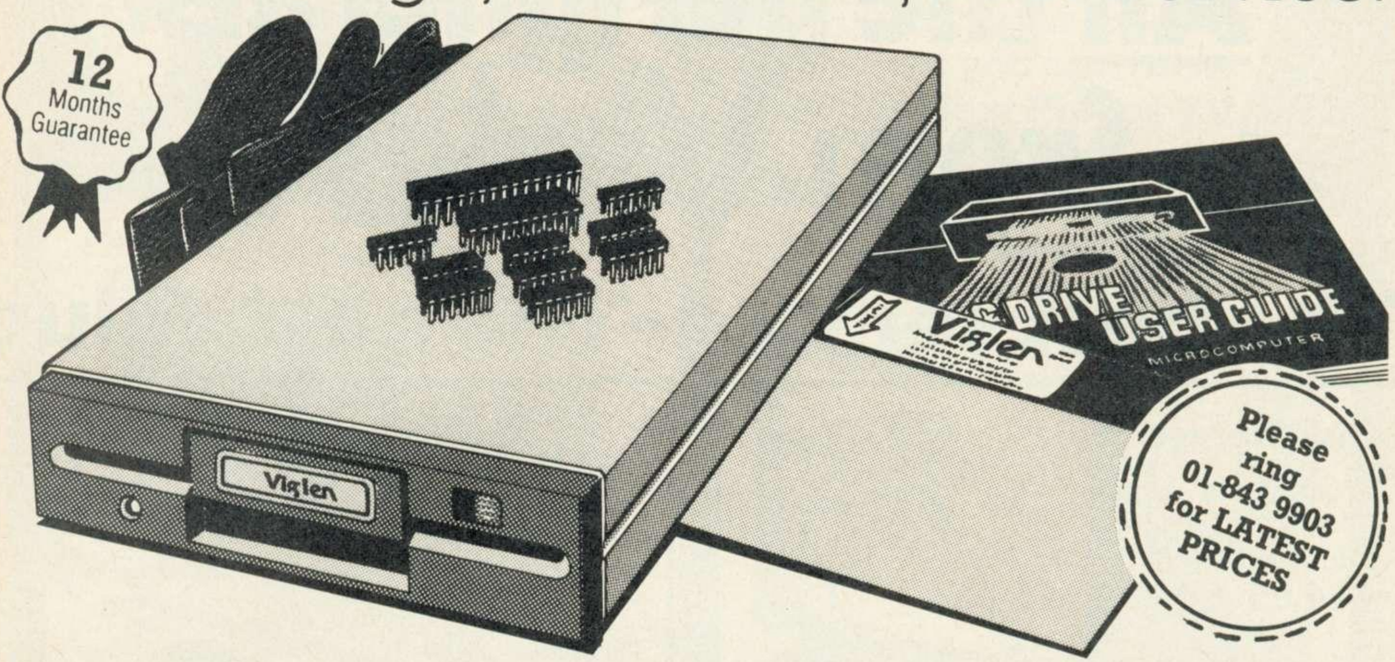
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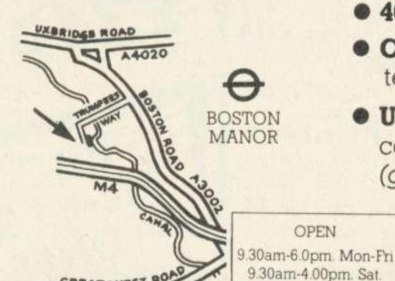
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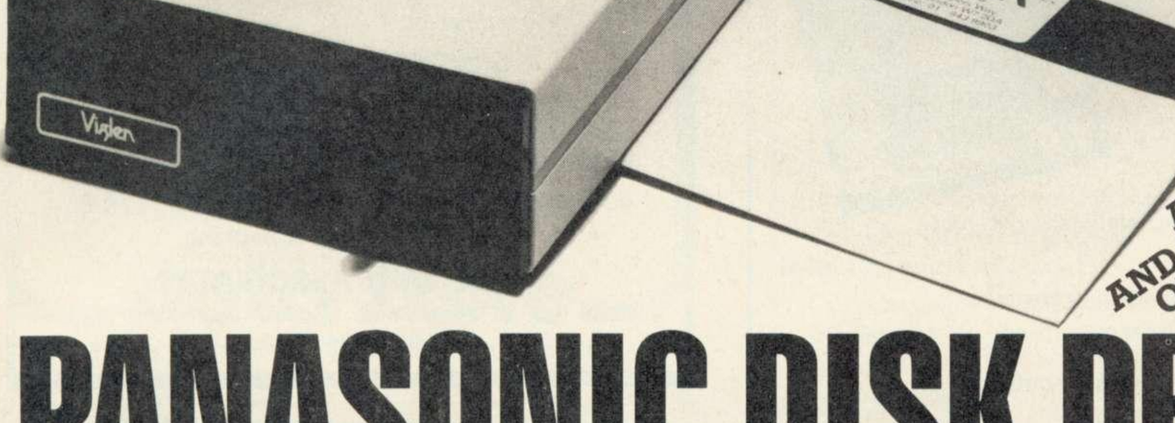
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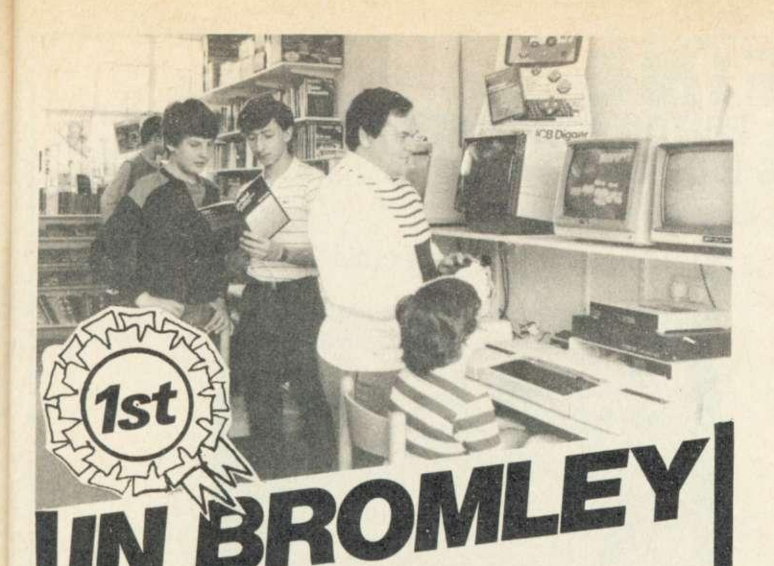
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... 'An excellent mixture of games' ... Personal Software – Autumn 1983.

EDUCATIONAL 2 *BBC/ELECTRON* *Tape £8.00 Disc £10.00*
Although similar to Educational 1 this tape is more advanced and aimed at seven to twelve year olds. The tape includes MATH 1, MATH 2, AREA, MEMORY, CUBECOUNT and SPELL.

FUN WITH NUMBERS *BBC/ELECTRON* *Tape £8.00 Disc £10.00*
These programs will teach and test basic counting, addition and subtraction skills for four to seven year olds. The tape includes COUNTING, ADDING, SUBTRACTION and an arcade type game called ROCKET MATHS which will exercise addition and subtraction. With sound and visual effects.
... "These are excellent programs which teachers on the project have no hesitation in recommending to other teachers." ... Computers in the Classroom Project, Riley High School.

FUN WITH WORDS *BBC/ELECTRON* *Tape £8.00 Disc £10.00*
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... 'Very good indeed' ... A&B Computing – Jan/Feb 1984

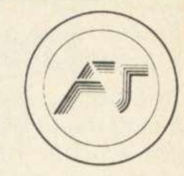
JIGSAW AND SLIDING PUZZLES by P. Warner *BBC/ELECTRON* *Tape £7.95 Disc £9.95*
There are two jigsaw and four sliding puzzles on a 3 × 3 and 4 × 4 grid. Each program starts off at an easy level to ensure initial success but gradually becomes harder. It helps children to develop spatial imagination and in solving problems. The tape includes: OBLONG, JIGSAW, HOUSE, NUMBERS, CLOWN and LETTERS.

KON-TIKI by J. Amos *BBC* *Tape £10.95 Disc £12.95*
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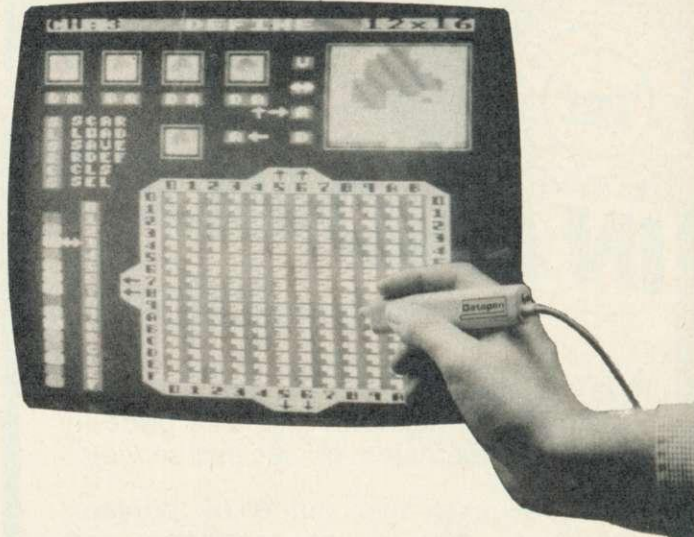
DEFINE

A MULTICOLOUR SPRITE CREATOR, EDITOR & ANIMATION CONTROLLER FOR THE BBC B COMPUTER

DEFINE is a suite of programs providing all the sprite and animation facilities needed to produce high speed arcade type games using your own multicoloured characters (sprites).

The package is extremely easy to use, every command being made with a lightpen, or joystick, directly from the screen. Real size and enlarged views of your sprites are continuously updated while you define or edit them and you may test animation sequences in the editor package as you go along. New sprites may be created by editing old versions and the number of sprites you may define is unlimited. Sprites may be any size up to 12 × 16 pixels and each pixel may have any of the 16 standard mode2 colours. The software needed to animate your sprites is provided as a separate program, which you can merge into your own BASIC, or machine code, program, allowing high resolution positioning with fast, simple commands. The number of sprites, or clones, you may have at any one time is unlimited (except by computer memory) and the speed of movement can be very fast if desired — over 400 sprites per second may be printed from BASIC, or 700 per second from machine code. Of course, you may link sprites in your own programs, producing giant sprites, or sub-animation. A 24 page handbook is supplied as well as a BASIC example program.

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DEFINE disc version	£11.95	
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Datapen

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University Software

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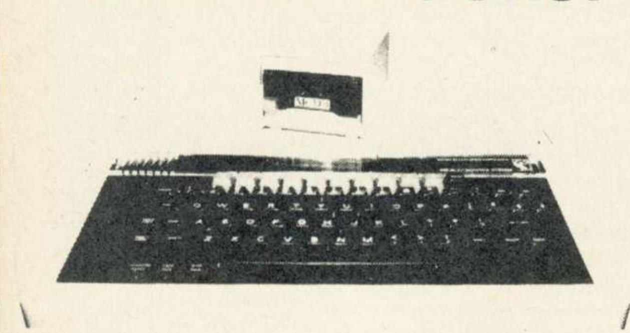
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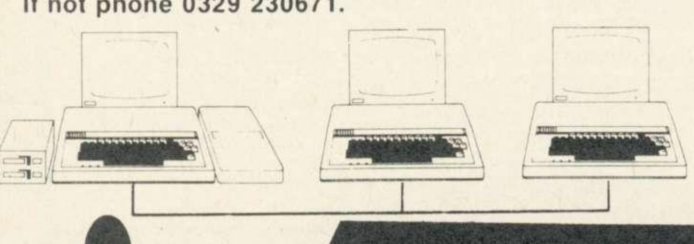
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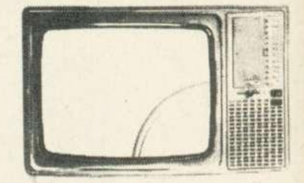
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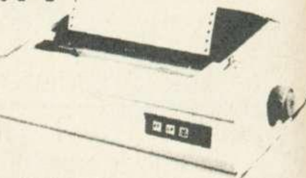


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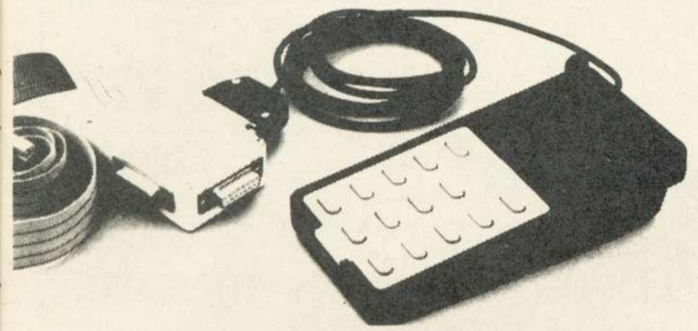
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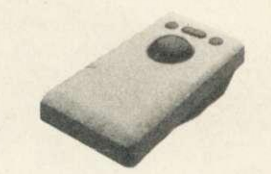


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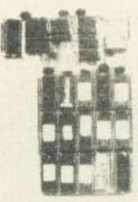


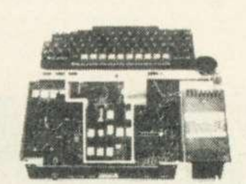
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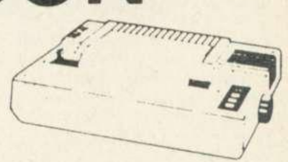




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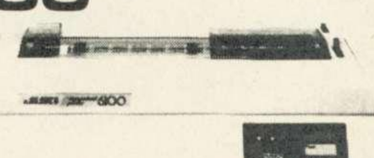
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AMERICAN personal/hobby computer magazines for sale or exchange. SAE list. Smith, 84 Edenfield Gardens, Worcester Park, Surrey KT4 7DY.

WANTED BBC B. Up to £225 paid. Also peripherals. Phone daytime 051-424 5558.

CUMANA disc drive for sale. Single sided, 40 track, with power supply. Little used, £99. Tel: St Albans (0727) 32214, evenings.

HELP required with advanced use of Juki 6100 and any suggestions for form filling programs. Telephone Nagy at 01-450 7811 ext 276 or evenings at 01-205 6213.

SEIKOSHA GP100A plus sheet feed attachment, spare ribbon and Watford Beebprinter ROM software. VGC, boxed, £140. Tel. Winsford (06065) 51461.

BBC model B computer with Acorn DFS and 100k disc drive – £600. Price includes £100 worth of books and software and ten floppy discs. Phone 01-348 6401 evenings. Microvitec RGB monitor, £180.

ACORN Teletext Adaptor with TFS ROM, under guarantee. Save £50 on list price, £175. Edinburgh. Tel: 031-445 3417.

£3000 TRS80 Model 4 64k twin discs, Seikosha GP550A printer, many discs, programs, books, manuals, programs model 3/4. Offers or exchange for BBC B with disc plus cash ajust. Ring am/pm with offer. 0473 85526.

GERMAN BBC user. Ideas on hardware and software wanted. Used modem, disc, printer. Number of friends are users in Germany and Belgium. Lars Steinsträber, Grüner Bogen 44, 2000 Oststeinbek, FRG. Hello World!

■ **To hire** a BBC computer of peripherals, ring Computer Hire Services on 01-607 0157. 294a Caledonian Road, London N1 1BA. We also hire out Spectrums, Commodore 64s and Amstrads.

■ **Joysticks** Now with 'Accutrak' analogue movements for games and CAD/CAM applications. Still best value at £12.95 per pair. Send now to: Peritron (Dept AU), 21 Woodhouse Road, London N12 9EN.

■ **Speech-editor** for Acorn speech system. Download PHROM/slice words/control parameters/ramdisk-type filing system. Cassette/instructions £8 (or details). Fylesoft, 15 Carmelite Crescent, Eccleston, St. Helens WA10 5LP.

■ **How-To.** An essential collection of S/W plus instructions for frustrated new disc owners. £5. Many satisfied users, R-Soft, 22 Marriotts Close, Felmersham, Beds MK43 7HD. 0234-781730.

■ **Elite** How to fully equip your ship and obtain as many credits as required, quickly, without leaving station. £2.25. Knight, 59 Market Street, Hindley, Lancs WN2 3AE.

■ **RML** to BBC. Transfer RML programs, data, text to BBC format. Supplied on disc, £12. Cheque/requisition: Foxsoft, 22 Canterbury Close, Doncaster DN5 8NR.

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■ **Floppy-Disc** head cleaner – don't risk corrupted discs and lost data. Memorex 10 disc kit, £8.95 + 75p p&p. Heath Micros, 162 Bardon Road, Coalville, Leics.

■ **Learn** to speak French, German, Spanish or Italian. **See** and **Hear** £7.95 (inc). Please state language BBC 32k. Electron. TBS, 29 Holloway Lane, Amersham, Bucks. 02403 21702.

■ **'Nutcrackers':** Tape 2 Tape + Tape 2 Disc + Disc 2 Disc + Disc 2 Tape: £5. Rompull + Tapedump: £5. Super disc menu: £5. ROM-filing system generator: £5. R-Soft, 22 Marriotts Close, Felmersham, Beds. MK43 7HD. 0234-781730.

■ **LVL** disc drive: dual 40 track drives + utilities disc and manual, £300. Tel: St Cross 247 after 6pm.

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■ **Listings BBC** and Electron, from cassettes, 5p per 58 line. Minimum £1 inc. p&p. Send tapes and payment to Printaprog, 149 Netherton Road, Wishaw ML2 0AR.

■ **$5\frac{1}{4}$" discs** Inclusive prices per 10, Dysan SS/DD £20, DS/DD £28, SS/DD (96 tpi) £28, DS/DD (96tpi) £35. Rhone-Poulenc SS/DD £17. CWO. Squirrel's Byte, 7 Coniston Road, Melton Mowbray, Leics LE13 0NE. (0664) 63617.

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■ **Modem** or telephone DIY extension kit. Contains new style socket, 15 meters of cable & full instructions. Why pay BT £25 when you can do it for only £9? Cheques to P Adamson, 55 Heol-y-Frenhines, Bridgend, S Wales.

■ **Card** Games series offers Partner Whist for 32k BBC B. Realism to suit players of all levels, £6.75. Also Draughts £6.75, Darts £4.75. DotSoft, PO Box 46, Hitchin, Herts SG4 0XQ.

■ **Spider Speller.** New, exciting, educational game for the BBC (B). 155 word vocabulary, joystick option, two skill levels, high score. Cassette £5, mail order only. Viking Software, Dept A1, 58 Central Avenue, Syston, Leicester LE7 8EE.

■ **Backups** of your valuable protected disc software are essential for your peace of mind. TWIN will provide them for 40 or 80-track discs – never known to fail. £8. J. E. Connett, Dene Croft, Westcott Street, Westcott, Dorking, Surrey RH4 3NY.

■ **Laser Attack.** New BBC (B) game for 1 or 2 players, 5 skill levels, joystick option, target score for replay, table of merit, high score. Cassette £5. Viking Software, Dept A1, 58 Central Avenue, Syston, Leicester LE7 8EE.

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Guy Kewny provides this month's April Fool.

New Elite is hot stuff

Details are emerging from Acornsoft of *Elite II*, thought to be the best thing since the Paul Daniels magic cheese grater. Instead of being a 6502 second processor version, as reported in some less reputable rags, it is in fact a multi-user version for the Econet.

Codenamed 'Braben' while Acornsoft trademarks the name 'Elite', it enables up to 253 players to take to the universe in a variety of roles. Players may choose between piloting trading ships, police ships or Thargoid craft, while some of our lady readers may like to try their hand at being space-stations.

An early version of the game is said to have been responsible for the major fire at Betjeman House, Acornsoft's HQ, just after Christmas. Apparently, games guru Neil Thunder-Storm discovered a bug that enabled him to pilot a sun through hyperspace and into space stations all over several galaxies.

This created unexpected strain on several of the Econet stations, one of which overheated and caught fire. Acornsoft's Jeremy Fire-Engine reports: 'The bug was quickly corrected – it doesn't make any difference to the competition.'

Acornflakes

News is just coming in of a successful takeover of Acorn by the foods giant Kellogg's. R&D staff at Cherry Hinton are already developing products for the revised range.

These include the Acorn Breakfast Computer, which is rumoured to have dual 3.5in toasters, full 96-shreddie keyboard, cereal interface, digital alarm clock and optional Teasmaid adaptor.

Cornflakes packets are to be introduced offering free Electrons with two tops (limited to 1000 per household), and for budding composers we can expect the Noises 500 add-on which allows a variety of bells, whistles, snaps, crackles and pops to be produced on 13 channels simultaneously.

Meanwhile, the BBC micro is to be discontinued and replaced with an upgraded version including 64k WAM (Weetabix Addressed Memory), high-fibre graphics and the ADFS (Advanced Dieters Filing System) which is reputed to lose overweight files automatically (stone me!).

Trike of truce

To prove that no animosity exists between Uncles Clive and Chris, Sir Clive very generously gave Chris a C5. Chris commented: 'I was very touched, I've a great passion for cars. I offered Clive a ride in it but he declined. Apparently he doesn't want to retire yet.'

Pandora's box

Readers of last month's issue will recall Rob Fenton's graphics program called Paintbox.

We have recently received a dainty letter from Quantel which suggests this article infringes their Paintbox trademark! On the other hand Quantel systems start at £72,000, so we can hardly be endangering their business! (And we're not the only magazine with this problem, but PO Box 109 refuses to comment. How come Pandora didn't have this kind of trouble?)

Heavy scene

Acornsoft's latest game, Magic Mushrooms, has really shaken up the Cambridge hippy market because it allows you to design our own trips! For readers with no experience of the capital of 'Silicon Fen', recall the words of John Peel who described it as a city of 'pot plants and muesli'. Geddit??!!

Boot boy

Now for some news from behind enemy lines. Uncle Clive won't have this rag in the house, and there's no chance of him ever hearing my dynamite revelations from anyone else, so here goes.

He's been on top form since his pub brawl – hopping around shadow boxing and practising his head butts on anyone he meets. Most of the staff have taken to wearing motorcycle helmets and sticking plaster over the bridge of the nose.

It's quite a sight, I can tell you – like a convention of aspiring Securicor guards who failed the aptitude test. He's determined to grind 'Rhogan Josh', as he calls poor Mr Curry, into the dust.

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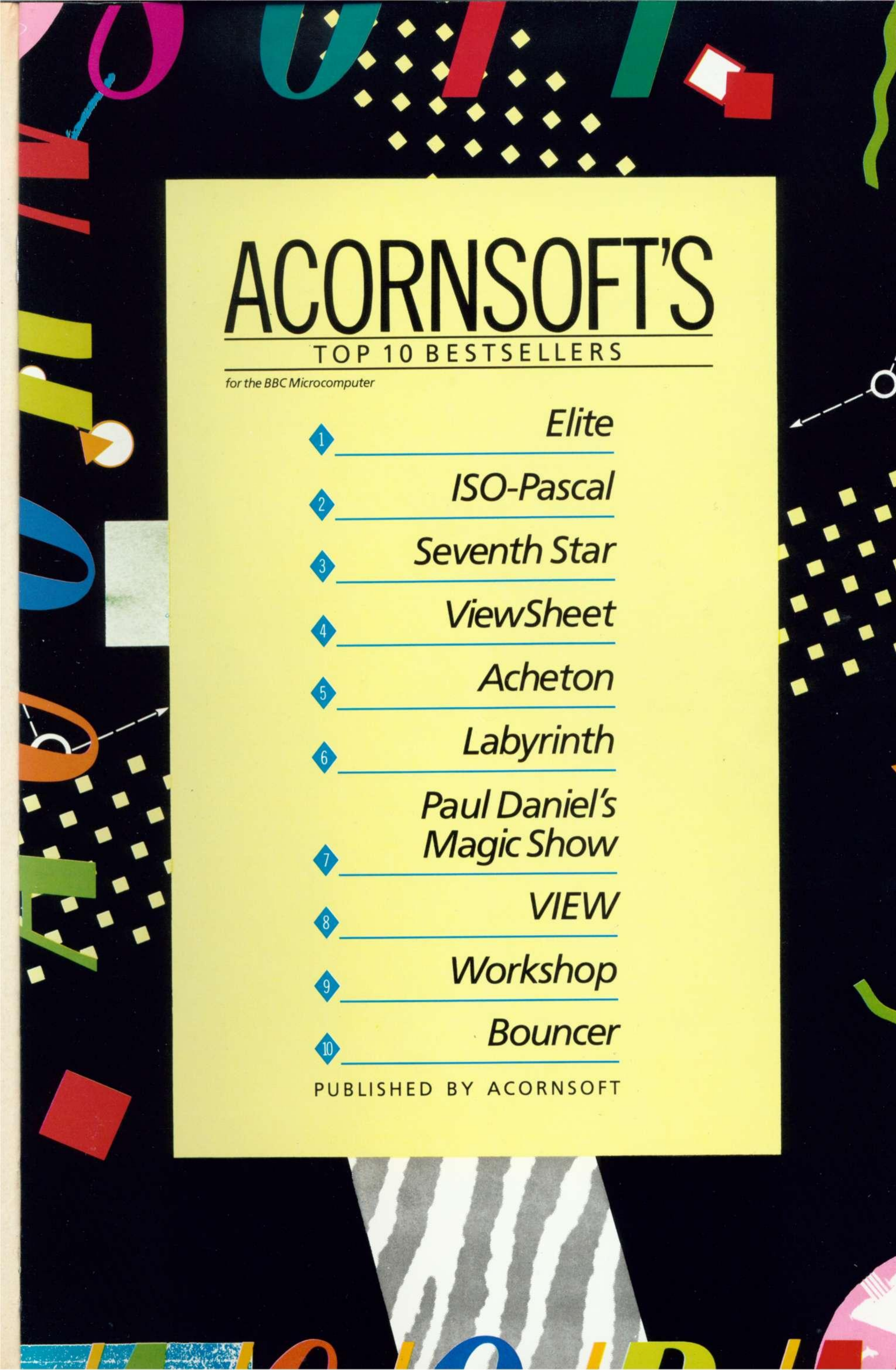
Thankfully, his pugilistic endeavours have taken his mind off the rather mixed reception given to his marvellous car, or the 'surgical boot' as we insiders know it.

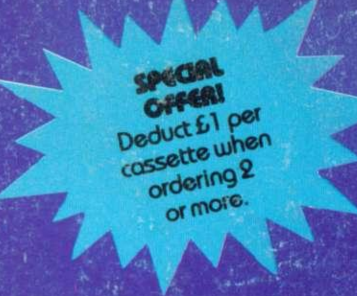
Despite opposition from feminist groups, plans are underway for a lady's high-heeled model. Also on the drawing board are an executive model, carpeted throughout with specially developed kingsize OdorEaters, and an off-the-road, three-wheel drive version using the most modern elastic band technology for its up-rated engine.

Getting the Bird

Silver Acorn winners at the recent Acorn Useless awards:

Best Fictional Serial – Jane Bird, 'I'll tell it my way.'
Jolly Roger Ideas award – Guy Qoony.
Unkel Kleiv Bathtub award for creative marketing – Nigel Searle.
Redwood 'Biggest must be best' award – Harold Fisher for his ABCs.
Tom Hillbilly award for best leak – CC for the 'C'.
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